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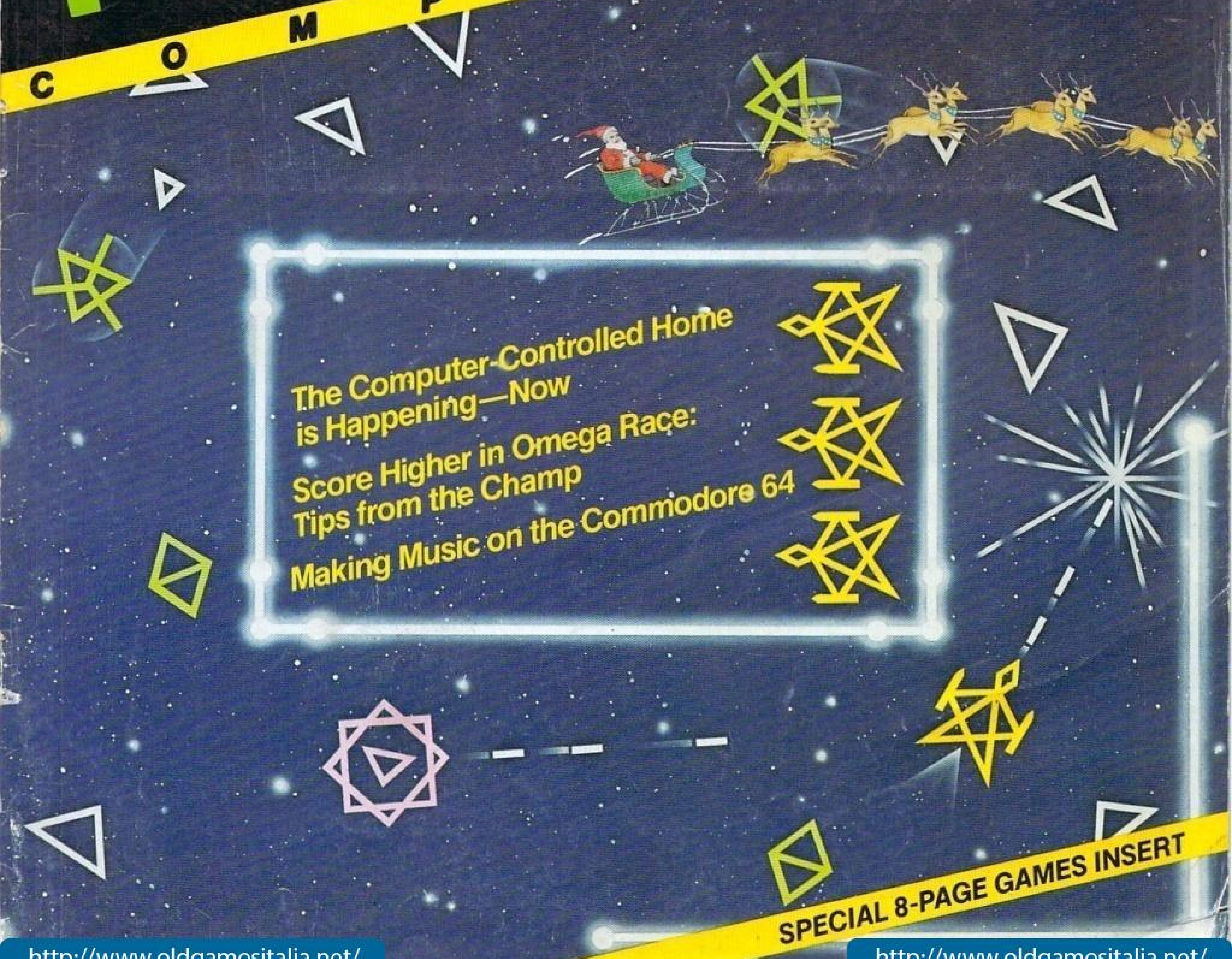

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Volume I Number 3

POWER/PLAY

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ON THE COVER: Santa risks life and limb crossing the Omegan battlefield to make sure all our readers get their new VIC 20 games for Christmas. See our exciting games insert for details.

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Braindrops

I'm beginning to develop a split personality. I first noticed it when I sat down to write the "Get Serious" column for this issue—formerly the responsibility of the congenitally stodgy Paul Fleming, who, until September was editor of *Commodore Magazine*. Well, it turns out that I've inherited Paul's magazine and all its stodgy accoutrements, in addition to the fun and games of *Power/Play*, at least for the time being. That doesn't bother me, except that it means when I need a "Get Serious" column for *Power/Play*, who has to write it? Me.

It's not that I don't like the serious side of Commodore's products. In fact, serious applications can be pretty exciting, sometimes. But look at it from this perspective. Here I am, having great fun putting together this issue of *Power/Play*. The special games insert looks terrific, Paul Higginbottom has done a super job on his introduction to producing music on the 64, I'm really turned on about the possibilities of the Homebrain, I'm playing all the nifty games submitted to the Commodore Challenge Contest . . . and then boom! I've got to sit down and Get Serious. Put on my Serious Commodore Magazine Editor head and pretend I'm stodgy. For a person of my temperament, this is not easy.

I'm not sure I pulled it off. In fact, I suspect I won't fool you for a minute into thinking I'm at all serious, and I've been feeling terribly guilty about it. It seems as if my only alternative is to develop two distinct and separate personalities. Maybe arrange it so one eye can read only green screens, the other only full color. Or devise a potion, a la Dr. Jekyll, that makes me unable to operate a joystick for several hours, so I have to concentrate on what some people around here call "real" applications, at least for short periods. Any suggestions?

While you're here, I'd like to point out that our own Neil Harris, whom you may remember as one of the technical editors of this book, has been dragged away from his job as all-purpose know-it-all and been forced to do something constructive—namely serve as Publishing Manager for both our user magazines. As we all knew he would, Neil has taken over the reins of this rampant pair of publications with grace and aplomb, and has already begun implementing his master plan for spreading the Commodore word into every nook and cranny of the civilized (?) world.

Oh, and one more thing. On behalf of everyone here at Commodore, I'd like to wish you a safe, happy holiday and a prosperous, peaceful 1983!

Diane LeBold

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We're Glad You Asked…

Q How does one "trap" the RUN/STOP key on the VIC 20? I am presently working on a pre-school program and am using GET statements instead of INPUT statements when I want an operator's response. Unfortunately, though, a child may inadvertently break the program by hitting the RUN/STOP key. I was unable to "trap" the RUN/STOP key in the usual manner, using GET A$ and the CHR$ ("X") function. I suspect one has to POKE the VIC's memory to trap the key, but where?

A You're entirely correct. To disable, POKE 788,194. To re-enable, POKE 788,191. You can use these commands wherever appropriate in your program. Side effect: this also traps the real time clock (TI and TI$).

Q How does one protect a VIC 20 program from being copyable?

A It's virtually impossible to protect any program from a determined thief. This is particularly true with programs on cassette. However, if you want to protect a program from a relatively inexperienced copycat, a simple technique is to put part of it (maybe some subroutines or calculations) into machine language. Because machine language is stored in a different part of memory than BASIC, if someone tries to copy the program by simply SAVEing from tape or disk, only the BASIC part of the program will be saved. And the thief will be foiled because the program will not run without the hidden machine language.

Q I want to use my VIC 20 with expanded memory AND the VICMODEM. How can I override the current prohibition? My work involves preparing texts at home, then calling a university computer to download the texts to add to other files and print on the high-quality printers.

A A fairly simple task. Plug in the memory expander you intend to use with the VICMODEM, type in the Terminal Software program in the VICMODEM manual and save it (with the memory expander in place). When you load and run, you've got the use of both expander and modem.

Q Why are these calculations not exact:

PRINT exponents of

```
        3↑4 = 81.0000001
        3↑6 = 729.000001
        etc.
```

A The problem is caused by rounding errors introduced when the computer converts decimal numbers to and from binary numbers. There are several ways around these inaccuracies, but the easiest one is to have the computer print only the first four or five (or seven, or whatever, depending on where the inaccuracy begins) numbers it sees.

Q Is there some way to look at what's in my VIC's memory?

A The best way is to use the VICMON cartridge. But if you don't have one, this little program will permit you to look inside your VIC's memory:

```
10 X=X+1
20 PRINT CHRS(PEEK(X));
30 Y=Y+1:IFY=500THENPRINT
    "CLR/HOME"X:Y=0
40 GOTO 10
```

When you type this in and RUN, the VIC will print on the screen each character stored in each of the 65535 memory locations. Since many locations are not in the VIC itself but in plug-in cartridges, when they are being addressed there will be no display. Also, if you'd like a less flashy but more informative display, change line 20 to:

```
Z=PEEK(X):PRINTZ;
```

This will give you the value in each location, rather than the character itself. For more information on what you're seeing on the screen, check your *VIC 20 Programmer's Reference Guide*, Appendix F. (Thanks to the VIC-NIC News, Box 981, Salem, NH 03079 for part of this tip.)

Q In the Fall 1982 issue of *Power/Play* you said it is not possible to restore the VIC back to its unexpanded state without removing the expander cartridges. Actually, restoring the VIC back to its unexpanded state is possible without removing the expander cartridge. UMI's BASIC Utility Program, BUTI (pronounced "beauty"), includes a command for setting the VIC to its unexpanded, VIC plus 3K, and VIC plus 8K or more configurations (if memory is available) without removing any cartridge.

Also, our experience has indicated that, when an 8K or 16K memory expander is added, the start of screen memory is at 4096 decimal, while the start of BASIC is at 4608 decimal. Your column said that under these conditions the start of BASIC is at 4096.

Sincerely,
David Lundberg
Technical Director,
United Microware Industries, Inc.

A Sorry we missed that simple error concerning the start of BASIC. Thanks for catching it.

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You may have either one or both of the talents necessary—the ability to create a new game with terrific play appeal and/or the ability to create excellent graphics on either the VIC or the CBM 64. If you have both talents—GREAT! If not, we'll team you up with a partner.

Compensation is wide open including full-time salaried situations or compensation based upon specific work performed. If you have an interest in telling us more about yourself, please write or send a resume to us at the address below. Better yet, if you have a sample of your work on diskette, cartridge or cassette—include it with your letter or resume.

All properties sent to us will be kept confidential and returned to you after evaluation if desired.

Address all inquiries to: John Mathias, Recreation Software,
Commodore Business Machines, 487 Devon Park Drive, Wayne, PA 19087

Access: Commodore User Groups

User groups have what we call a synergistic effect. That is, cooperative effort achieves things that individuals probably couldn't accomplish independently.

To encourage that cooperation, and help you get the most out of your home computing experience, this section of POWER/PLAY is devoted to getting users together.

Let us know what your group is doing, send messages via free "classified" style ads, or simply list your group. We'll do whatever works to help you contact other users and/or get the information you need.

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User Hints

from the Wichita VIC 20 Group Newsletter

Our VIC 20 user group in Wichita regularly produces a newsletter full of useful hints and interesting insights. These are a few items from that newsletter we thought might be of interest to the rest of our users. By the way, we'd like to see more of your newsletters, so if you're producing one, please put us on your complimentary subscription list.

The VIC 20 Programmer's Aid Cartridge

Walt Lounsbery
Wichita, KS

After working with large mainframe computers like the VAX 11/780 or IBM 370, we tend to get spoiled by their full-screen editors, program debugging features, and use of special function keys. It becomes difficult for us to get along without them. Well, if you are frustrated by the lack of these features on the VIC 20 or if you do much programming at all, you should welcome the Programmer's Aid cartridge by Commodore. It adds utilities and new BASIC commands that most mini-computers lack, making program development a snap.

To be sure, this cartridge is most useful with a memory expansion. Although it occupies a high memory ROM slot, certain functions require the use of 122 bytes at the top of program memory. This can be critical for the basic VIC. Personally, I feel that this is a very small price to pay. The cost of the cartridge is more of a consideration, though, at about $60. There are no free bargains.

In deference to those learning about programming with your VIC, the following list of commands include a short description. If you have not used features like these before, I would highly recommend trying out the cartridge at a dealer to see how helpful they are. The commands are:

Auto—Automatic line numbers for program entry. It is possible to specify the first line number and the difference between line numbers. If program lines are in memory, it will start at the end of the current program.

Change—This powerful command will search the entire program or a specified line number range for a particular BASIC command or string (the string must be in quotes). It will also locate variables. All occurances in the range will be changed to a new command, string, or variable that you specify. This command can screw up REM statements since it does not know what they are.

Delete—Deletes program lines. Operates just like the LIST commands, so you can delete all lines before a line number, from a line to another line, or all lines after a line number.

Jump—Displays the values of all variables in a program at the time of execution, except array variables. If there are many variables in the program, it may be wise to use CMD 4 and DUMP the variables to the printer!

Edit—Change the function key assignments to the EDIT mode.

Find—Find BASIC code or character string enclosed in quotes. This can operate over a specified line range. It displays each line with the desired code or string.

Help—Upon an execution error in a program, HELP can be immediately entered from the keyboard to display the line in which the error occurred and the position of the error on the line will be highlighted in reverse characters.

Key—Display the current special function key assignments. Keys can be assigned different functions or commands, up to ten characters.

Kill—Disable the Programmer's Aid cartridge. This is desirable in time dependent programs as the cartridge operation slows down the program.

Merge—This adds program lines from the cassette or disk drive to the program in memory.

Off—Turns off the TRACE or STEP functions.

Prog—Activates the PROGRAM mode special key assignments.

Renumber—Renumbers program lines, altering all GOTOs, GOSUBs, and so on to correspond to the new line numbers. The first line number and the line number increment can be specified. The entire program is always renumbered.

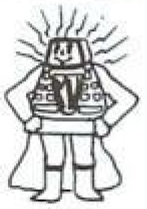
Step—Runs one line of the program each time the shift key is pressed. The line number that has executed appears in a reverse field "window" at the upper right corner of the screen.

Trace—Displays the line number in execution. The line numbers are scrolled through a small reverse field "window" at the upper right corner of the screen. Speed of the program can be slowed by pressing the control key or the shift key.

These commands are very powerful additions for editing or running BASIC programs. In fact, the manual does a good job of fully describing these functions, except the KEY function. It is important to know that if the special function keys are reassigned through the PROG OR EDIT commands, the key assignments that have been made by you will be erased and lost. Up till now those assignments have not been listed here. They are:

PROGRAM MODE	EDIT MODE
UnSHIFTed	
(KEY 1) F1—LIST	F1—LIST
(KEY 3) F3—RUN (ret)	F3—RUN (ret)
(KEY 5) F5—GOTO	F5—DELETE
(KEY 7) F7—INPUT	F7—TRACE (ret)
SHIFTed	
(KEY 2) F2—MID$	F2—AUTO
(KEY 4) F4—LEFT$(	F4—DELETE
(KEY 6) F6—RIGHT$(	F6—CHANGE

(continued on page 51)



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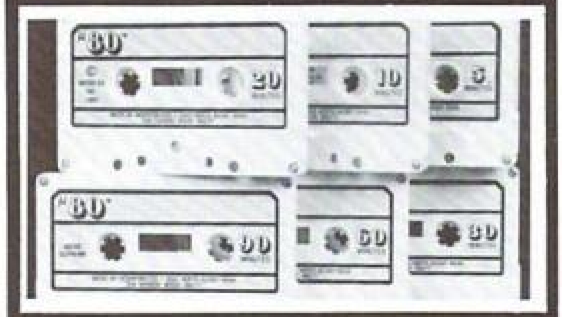

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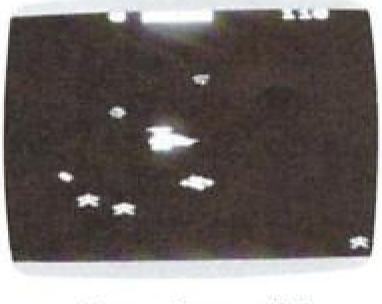

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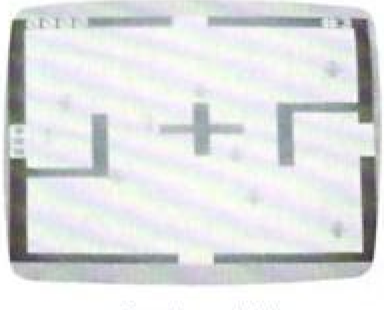

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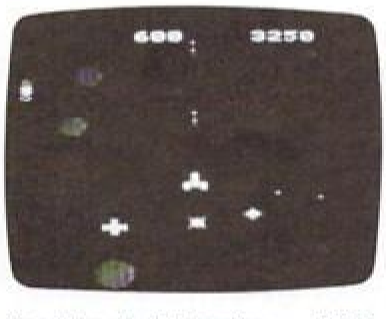

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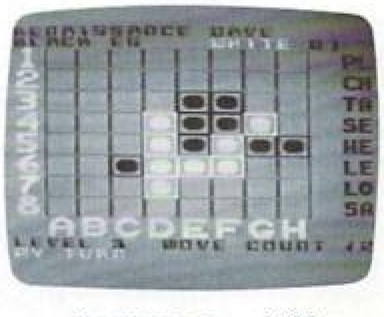

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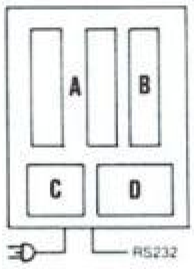

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This model home in Bridgewater, New Jersey, looks normal, but it has computer control as standard equipment.

It's time to stop acting as if computer-controlled homes were science fiction or decadent fantasy-fulfillment for the very rich. The fact is, if you're a home owner, have children, pets or aging parents living with you, or work away from home, computer control of certain facets of your home not only can help you save money and time, but can help ease your mind in ways you probably never considered before.

And here's the kicker. With a VIC 20 (or any computer) and the Homebrain from Hypertek, Inc., in Somerville, New Jersey, you can set up a completely computer-controlled home for about the same price as installing a security system.

What does computer control mean to an average family? Pardon me if I go right for the pocketbook: it means you can save a significant amount of money on your heating and cooling bills.

But that's far from the whole story. It also means your home is secured against break-in, and, in conjunction with a smoke detector, your family protected if a fire starts. That, if you're at work, you can know if your children don't get home from school by a certain time, or your elderly parent isn't up and around—through the same kind of motion detectors used in security systems, connected, in this case, to a modem that let's the Homebrain phone your office.

On the lighter, just slightly decadent side, it also means you can have your coffee ready when you get up in the morning, your roast turned on so it's cooked by the time you get home, your lawn watered, your lights turned on or off automatically when you enter or leave an area, your garage door opened, your clothes dried and dishes washed, and, if you have a pet door installed, your pet let in and out.

And if you're away for a long period of time, it means you can call your Homebrain on the phone, using a computer and modem, to change its instructions or get a read-out on what's been going on around the house. This is not science fiction. It's possible—and affordable—right now.

Let's talk about the possibilities for home energy management, first. The Homebrain can be programmed to decide the most efficient times to turn heating or cooling off or on (and in which rooms), or choose which energy source to use, should you have more than one. And, if you have time-of-day rates available in your area, you can program the Homebrain to decide the most cost-effective time to run costly appliances like clothes dryers.

To understand exactly how computerized home energy management works, let's digress briefly to take a look at the "Future I" model home in Georgia, where a Commodore 8032 computer is managing several energy systems as part of an experiment in home energy

In the kitchen of the model home, the VIC 20 and monitor can be hooked up to communicate with the Homebrain in the basement.

conservation. Future I uses a combination of photovoltaic, passive solar, and standard electric (including a heat pump) for most of its energy. The computer's job is to decide which energy system to employ and when, to obtain the most cost savings.

For instance, during a summer day, when the photovoltaic cells are generating energy like crazy and not much energy is being consumed by the house, the computer might decide to run the dryer. Or, better yet, it might sell the excess energy back to the power company to get credit for the household's account. (During those times it would also be sure to close the blinds in the passive solar collector room.) When the power company's rates go down, during low-usage times, the CBM might turn on the dishwasher. The results of this experiment are showing that computerized energy management of this type can lead to substantial savings on the energy bills of a typical household. (For the full story on Future I, see the December issue of *Commodore Magazine*.)

According to Marty Burns, president and founder of Hypertek, Inc., the Homebrain can be programmed to take over all these same kinds of energy management functions. The advantage of operating through a Homebrain rather than directly through a computer, according to Burns, is that once you program the Homebrain, you can then unhook the computer.

"That way the computer isn't tied up all the time running the house," Burns points out. "So you can still use it to play games, or perform other home management functions. Or, especially with a VIC or a 64, you could even take the computer with you if you go on a trip, and use it to communicate with your Homebrain via a modem to change the program or find out what's been going on—from thousands of miles away."

In a more conventional household than one like Future I, the Homebrain will turn down the heat or air conditioning when you leave for work, and turn them back up just before you return. If you'd like to track energy losses in your house, program the Homebrain to monitor the number of times thermostats go on in various areas. Or, if you want to get elaborate, use motion detectors to have the Homebrain turn on heating or cooling in only the rooms where motion is sensed, and turn it off again after a given time period of no motion.

The Homebrain also serves as a home security monitor, using motion sensors at doors and windows to detect any unwanted presence. What happens once a break-in is suspected is pretty much up to the individual home owner. The Homebrain can be programmed to do anything from simply turning on lights to sounding alarms and dialing up the local police. Of course, false alarm prevention can be programmed in, too.

When it comes to fire detection, the Homebrain works through a standard smoke detector system. Once the smoke detector is activated, Marty Burns says, the Homebrain can turn on all the lights in the house, sound alarms, call the fire company and, importantly, shut down the heating and ventilating systems to prevent circulation of smoke. Again, false alarm prevention can be built into the system. You don't want the fire company banging down your door because the toast burned.

Another of the Homebrain's fortés is lighting up your life—and making sure the lights are out when they're supposed to be. On those dark mornings when you stumble into the hall on the way to the bathroom, there's no need to bump into that chair. With the help of a motion

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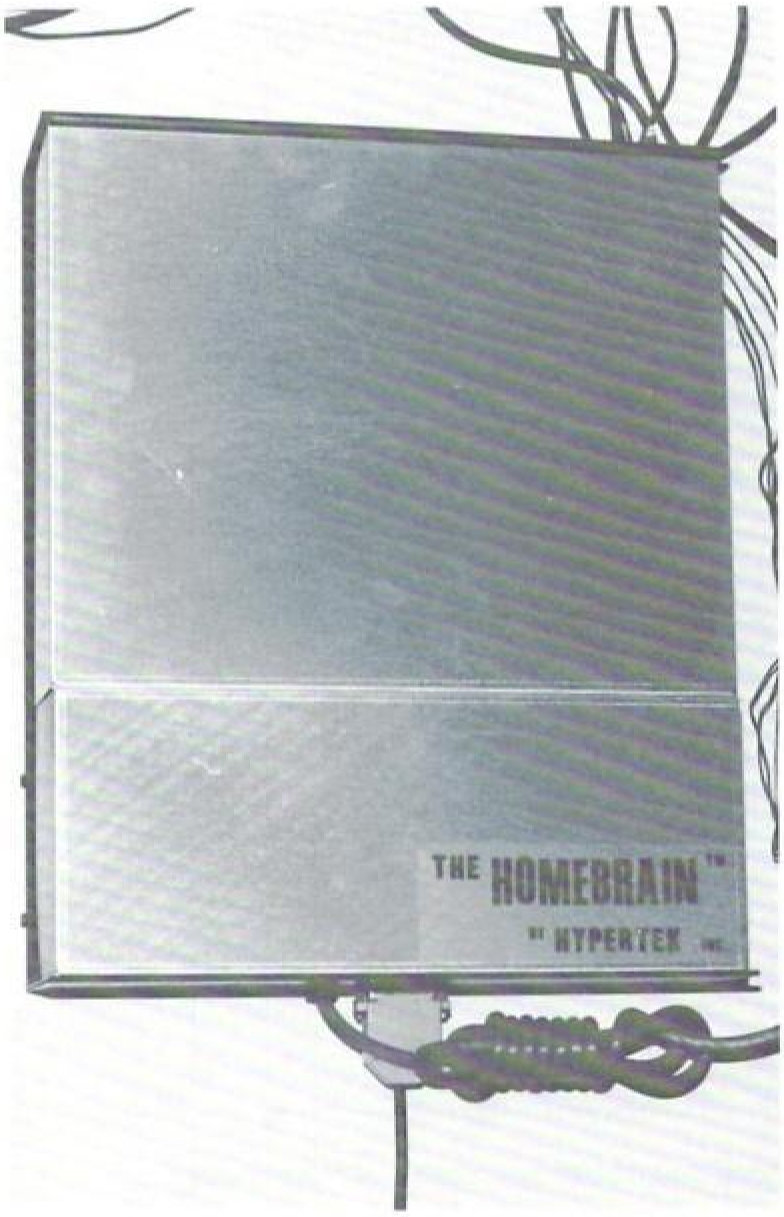
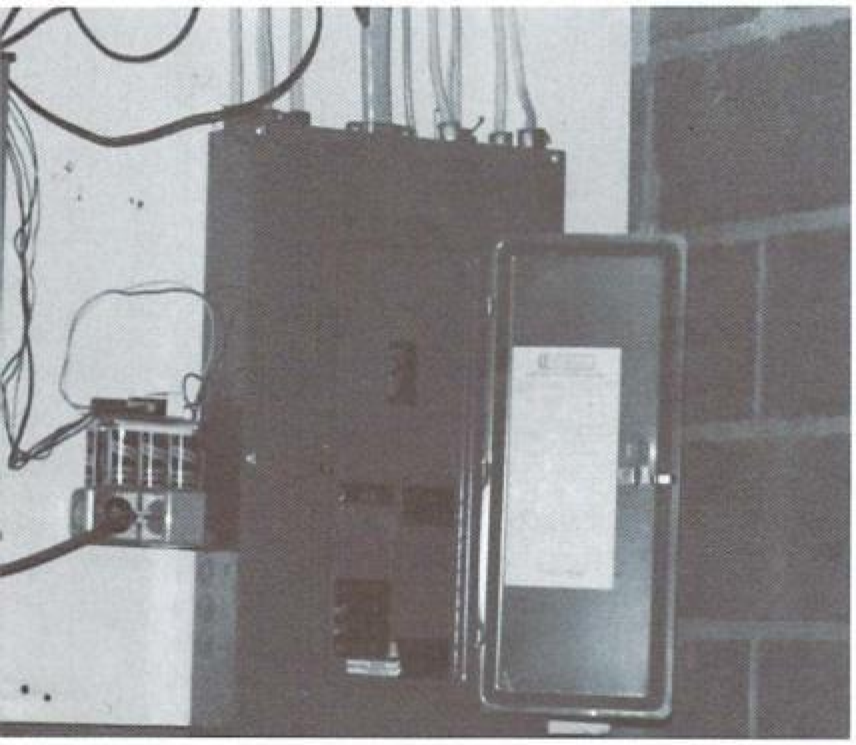


The Homebrain: Will computer control become a standard feature in new homes?

Marty Burns, president of Hypertek, Inc., with the Homebrain he has tucked away inconspicuously in the basement of the New Jersey model home.



detector, the Homebrain will turn on the hall light for you, then turn it off a little later.

Coming home late from work? The Homebrain will have the porch light burning. Going on vacation? Switch into "vacation mode" and the Homebrain will turn lights on in a slightly random fashion to simulate your presence—in addition, of course, to turning down the heat, arming the security system and monitoring whatever else needs monitoring, including how many times people come to the door and how much energy is being used.

According to Burns, installation of a Homebrain is not difficult. Right now Hypertek is in the process of installing one in a model home in Bridgewater, New Jersey, a pleasant—and very normal-looking—suburb about 15 miles outside Princeton. In this house, the VIC and monitor can be hooked up in the kitchen when you need to talk to the Homebrain or reprogram it, but the Homebrain itself is tucked away inconspicuously in the basement, next to the circuit breaker box.

Burns says wiring is kept to a minimum through the use of BSR-X10 power line carriers in switches, outlets and appliance modules. These remote control modules, available in most home improvement centers, allow the Homebrain to inject a signal right into the existing AC line, so no additional wiring is required for many common household devices. Motion detectors and other devices that require additional wiring are hooked up with low-voltage intercom wire to the Homebrain.

"The beauty of the Homebrain system," Burns says, "is that we can program it to do anything you can dream up. When we set up the system, we sit down and work out everything you want it to do, reduce it to a logical system, and program it in. A homeowner can do the programming him- or herself—or can do it with assistance from our professional installers."

In addition, the Homebrain also has its own uninterruptible power supply that maintains power up to three hours for selected functions. In the event of a power failure that lasts longer than three hours, the Homebrain remembers where everything was set, so when power is restored, it resets everything to its proper function level.

If all this sounds interesting, here's one more for you. The Homebrain uses, according to Marty Burns, an absolute maximum of five watts. At current electric rates, that's a cost of about $4.00 a year to operate it, day and night.

With a Homebrain, a VIC and conventional devices like switches, thermostats, and motion detectors, it's possible to have computer control over many household functions. As Marty Burns puts it, "All you have to do is *think* of what you want the system to do, and you can make the Homebrain do it."

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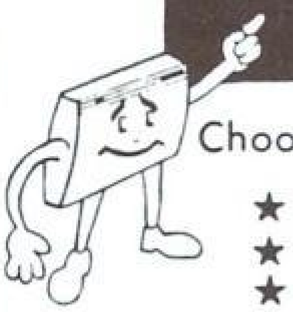

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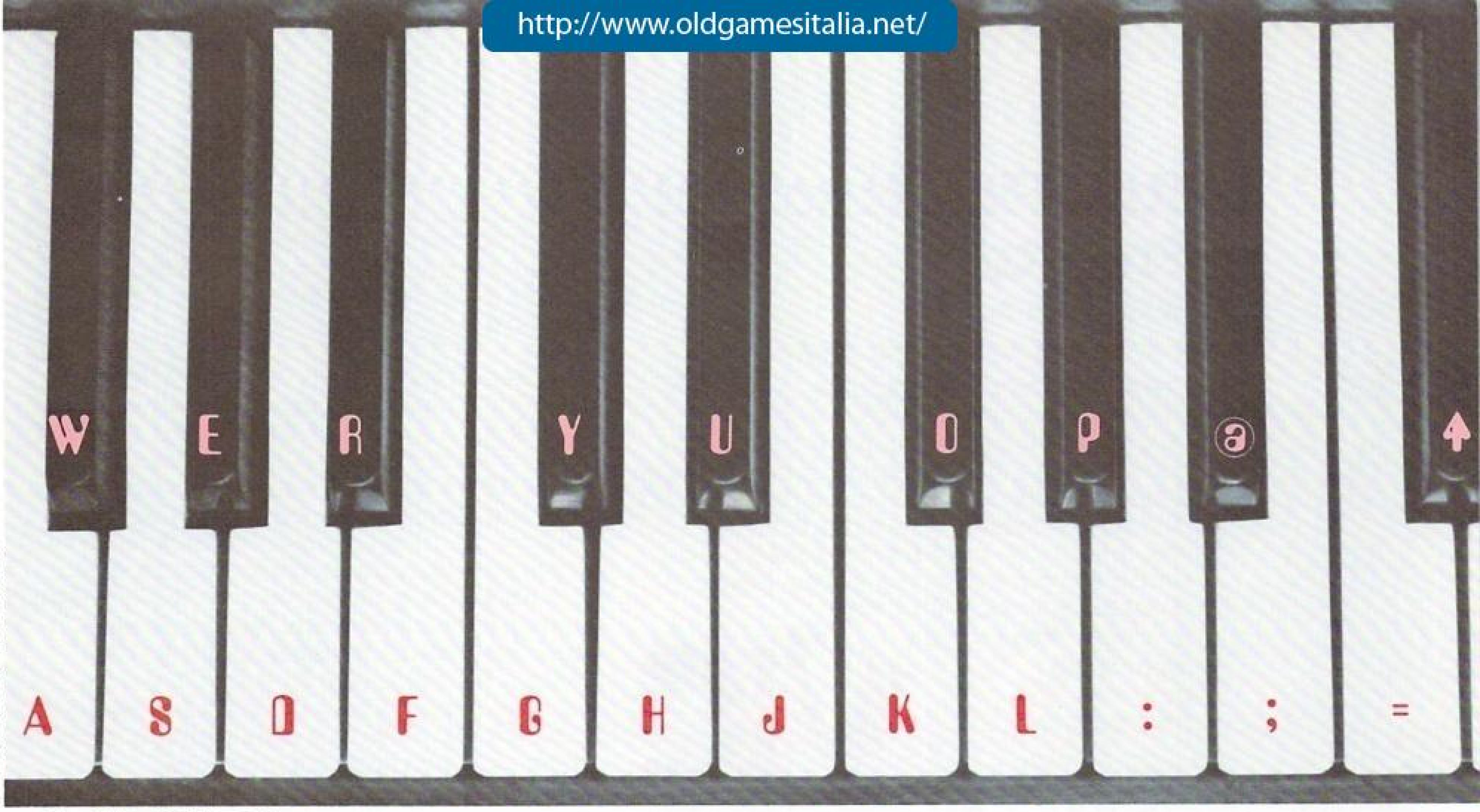

Photograph by Will Stanton

A VIC Piano

The VIC Sound

Built into its hardware, the VIC has a sound generation system. The output is fed into the audio channel of your TV set, so you can produce realistic effects with a minimum of programming.

Three independent tone generators can be activated and mixed, each with a frequency spectrum of three octaves. Thus, harmony or three-voice music is possible, if you change the frequency of the generators. In addition, the volume may be software controlled. For special sound effects, like explosions and lasers, there is also a "white noise" generator.

To achieve control of the sound capabilities of your VIC, POKE the registers within the VIC chip as follows:

Decimal	Hex	Function
36874	$900A	Tone generator 1:0 gives no sound. 128 to 255 gives a tone (see below)
36875	$900B	Tone generator 2
36876	$900C	Tone generator 3
36877	$900D	White noise generator. Output varies from an airplane buzz to whistling wind.
36878	$900E	Volume: 0 gives lowest volume and 15 the highest. Note that the volume control on the TV must also be turned on.

Using the Sound Generator

Though sounds can be generated using simple POKE commands in live mode, the most common method is to use a BASIC program. Notes are read as text strings from data statements, converted to POKE values, and then activated inside FOR. . .NEXT loops to time the notes correctly. Alternatively, a small program can be written to GET characters from the keyboard, so the VIC could simulate a simple three-voice electronic organ! As time goes on, our VIC users will undoubtedly build up a massive library of subroutines to generate special effects and games sounds.

Piano Program

To give you an idea of the VIC's sound capabilities, we thought you'd enjoy this simple little piano program. It starts on the note F and runs about an octave and a half up to C#. The "white keys" are "played" on letters A, S, D, F, G, H, J, K, L, :, ;, and =. "Black keys" are played on W, E, R, Y, U, O, P, @ and ↑. It won't turn you into Mozart, but it should give you a good sense of how you can use your VIC for sound. For more detailed information, check the *VIC 20 Programmers Reference Guide.*

```
10 S2=36874
20 V=36878
30 DIMA(36)
50 FORN=0TO36
60 READA(N)
70 NEXTN
80 GETA$:IFA$=""THEN80
90 IFA$="←"THEN200
100 N=ASC(A$):IFN<58ORN>94THEN80
110 POKES2,0
120 POKEV,15
130 POKES2,A(N-58)
140 GOTO80
200 POKEV,0
210 END
300 DATA237,239,0,240,0,0,238,209,0,0
310 DATA219,217,223,225,228,0,231,232,235,0
320 DATA0,233,236,0,221,215,0,229,0,212
330 DATA0,227,0,0,0,0,241

READY.
```

Your First Practical Program

by Michael S. Tomczyk

Reprinted from Commodore Magazine, April, 1982

Creating "Practical" Programs

Some people can't cook (like the VIC Magician). But by following a recipe point by point, even the VIC Magician can come up with some tasty concoctions. Programming your VIC 20 is just like cooking—the ingredients in a program can be mixed and matched like a recipe. All you need is a menu of neat little programs you can put together in various ways to create sophisticated practical programs for home, school or business. This modular approach helps you do complex computing with a minimum of experience and allows you to take advantage of some sophisticated programming techniques, even if you're just a beginner.

One Step at a Time

Writing a practical program is easy. Just take everything one step at a time. You'll find that most practical programs use the 6 steps shown below. There are many other approaches but this should give you a good start. Oh. . .one caution. . . don't get bogged down with "cosmetics" like graphics or screen placement. Your first task is to get the program WORKING in terms of instructions, calculations and results. The cosmetics and adjustments are the LAST elements to add to your program. To use our cooking analogy, broil your steak first, then add the seasoning. Here then are 6 elements involved in most practical programs:

1. DISPLAY (PRINT) QUESTIONS OR CATEGORIES ON THE SCREEN.
2. CONVERT THE USER'S TYPED-IN RESPONSES TO "INPUT VARIABLES." (In other words we translate what the user types in from the keyboard into

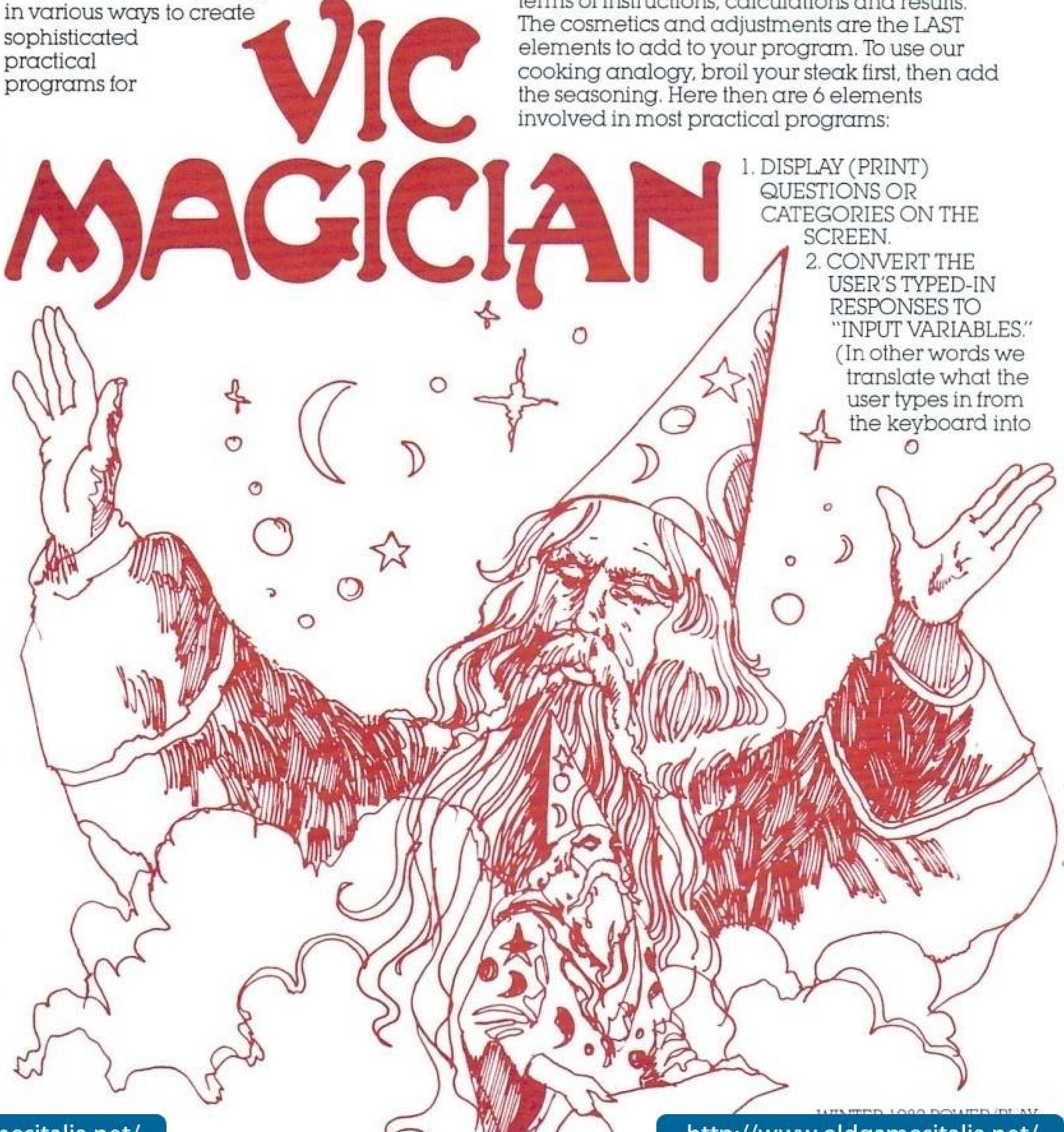

Illustration by Don Dyen

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short string or numeric variables the VIC can understand and work with.)

3. USE THE INPUT VARIABLES TO CALCULATE THE RESULTS YOU WANT TO SHOW.
4. DISPLAY (PRINT) THE RESULTS OF THE CALCULATIONS, ALONG WITH SOME DESCRIPTIVE WORDS.
5. REPEAT THE PROGRAM OR END THE PROGRAM.
6. ADD COSMETICS (to make the program "friendly").

Each program is different, of course, but these are the basic parts of most practical programs. The hard part is putting it all together. Most of us are intimidated by long programs with lots of fancy commands and mysterious variables, but those programs didn't start out to be that long or fancy. They started very simply and grew as the programmer kept adding elements to make the program more powerful or "friendly."

Plan Your Program Carefully

So you're ready to write your practical program. The first thing to do is make a CHECKLIST of what you want your program to accomplish. Try to write it in chronological order. It it's a long list, break the elements down into the simplest steps and build the program slowly, starting with the program's LOGIC. Here's an example of the checklist used for an INCOME/EXPENSE program described in detail below:

1. NAME OF PROGRAM: INCOME/EXPENSE BUDGET
2. CLEAR SCREEN
3. ENTER TOTAL INCOME
4. ENTER EXPENSE CATEGORY (3 ITEMS)
5. ENTER EXPENSE AMOUNT
6. ADD TOTAL EXPENSES (E1+E2+E3 = EXPENSES)
7. COMPUTE NET INCOME (INCOME—TOTAL EXPENSES = BALANCE)
8. FIGURE PERCENT OF TOTAL EXPENSES FOR EACH CATEGORY (E1/E = %)
9. EXPENSES = WHAT PERCENT OF INCOME? (EXPENSES/INCOME = %)
10. INCLUDE ROUNDING FUNCTION TO ROUND ALL NUMBERS TO 2 DECIMAL PLACES (CENTS) (POSSIBLE DEF FN).

From here, you can either do a more detailed programming flowchart using standard flowcharting symbols and notation, or you can simply make programming notes next to your original checklist, as shown above in parentheses.

Some Practical Programming Tips

Before we get into our program example, let's go through some fairly standard practical programming tips, with some shorter examples to show you how various techniques work.

CLEAR THE SCREEN

The first line in most practical programs is a clear screen command. Clearing the screen is covered in the VIC 20 user's guide, but here's a quick refresher. Normally, you CLEAR the screen by holding down the SHIFT key and hitting the CLR/HOME key. In your program, you will simply add an opening line number and PRINT the CLEAR command, like this:

```
10 PRINT" ♥ " (Type SHIFT CLR/HOME
               here. . .the reverse heart
               symbol appears whenever
               you CLEAR the screen
               inside quotation marks)
```

The CLEAR command doesn't have to be on a separate line. You can include it in your first PRINT statement, if you like, for example:

```
10 PRINT " ♥  MONTHLY INCOME"
```

USE PRINT STATEMENT TO PROMPT (INSTRUCT) USER

A "prompt" can be a question, word, phrase, number, instruction or category. It simply helps the user type in the right information. Here's an example of a PRINT statement that "prompts" the user to type in his monthly income:

```
10 PRINT "MONTHLY INCOME:"
```

USE INPUT & VARIABLES TO ACCEPT USER INFORMATION

An INPUT statement automatically places a question mark (?) on the next line after the prompt you PRINTed, and causes the VIC 20 to wait patiently until the user types in a response to the prompt. Here's an example of an INPUT statement:

```
                     VIC SCREEN
YOU TYPE THIS:       SHOWS THIS:
10 PRINT "MONTHLY    MONTHLY INCOME:    (VIC displays this
   INCOME:"                              and "waits")
20 INPUT M           ?
30 PRINT "YOUR       1000 INCOME     ←  (You enter this)
   INCOME IS" M
(type RUN & hit      YOUR INCOME IS 1000 (VIC responds)
   RETURN)
```

What we did here was first PRINT the prompt message. . . then we told the VIC to wait for an INPUT (response) to be typed from the keyboard, and assigned the variable name M to the value representing monthly income. The PRINT message in line 30 simply proves that the VIC accepted this information.

INPUTs can and usually are on the SAME LINE as the PRINT statement. You can save memory space and increase your program efficiency by combining the PRINT and INPUT statements on one line. Be sure to separate both commands with a colon (:) as shown:

```
10 PRINT "MONTHLY INCOME":INPUT M
```

You can also combine several INPUTS on one line. For example:

```
10 PRINT "ENTER 3
   NUMBERS":INPUTA:INPUTB:INPUTC
20 PRINT A;B;C
```

VICtip for First-Time Computer Owners

TO ENTER A PROGRAM LINE INTO THE VIC 20—just type the line number, the program commands or statements, and hit the RETURN key.

TO SEE THE PROGRAM LINE(S) OPERATE—type the word "RUN" and hit RETURN.

TO SEE YOUR PROGRAM DISPLAYED LINE-BY-LINE—for editing purposes, type the word "LIST" and hit the RETURN key.

TO CHANGE A PROGRAM LINE—either use the CURSOR keys to move to the line and change it, then hit RETURN, or retype the line number and hit RETURN (the new line with the same number will replace the old one with that number).

TO DELETE A PROGRAM LINE—simply type the line number of the line you want to delete and hit RETURN (to delete line 10 just type the number 10 and hit RETURN).

How Variables Work With INPUT Statements

Variables allow the VIC to accept information typed in by the user and then use that information in the program! Variables are in fact the key to interactive programming (this series places a lot of emphasis on variables because they're so important. . .your ability to program increases greatly if you understand how variables work).

You can think of a variable as a "storage compartment" where the VIC stores the user's response to your prompt question. For example, you can write a program that asks the user to type in his name. In this case, you might assign the variable **N$** to the name typed in. Now every time you PRINT N$ in your program, the VIC will automatically PRINT the name the user typed-in! Type the word NEW, hit RETURN, and try this example:

```
10 PRINT"YOUR NAME":INPUT N$
20 PRINT"HELLO,"N$
```

You might have noticed that we used variables like A,B,C and M to represent numbers in earlier examples, but here we use the variable N$ to represent a name. We used N to remind ourselves that this variable stands for "NAME" and we used a dollar sign to signify a string variable. This is important because variables come in two flavors: numeric variables and string variables.

NUMERIC VARIABLES are used to store number values such as 1, 100, 4000, etc. A numeric variable can be a single letter (A), any two letters (AB), a letter and a number (A1), or two letters and a number (AB1). You can save a little memory by using shorter variables but letters and numbers (A1, A2, A3) are often best if working with different categories in the same program. There is also a special type of numeric variable called an integer variable which eliminates decimal places from your numbers (helpful if you want calculations represented as whole numbers instead of numbers with long decimals). To get integer (whole) numbers, simply put a percent (%) sign at the end of your variable name (i.e., A1% or AB%) which makes the VIC treat all numbers typed in as whole numbers only, dropping any decimal places. Note that the percent sign here doesn't mean you are calculating real percentages. It's simply a symbol used with integer type variables.

STRING VARIABLES look just like numeric variables except they end with a dollar sign ($) like A$ or A1$. String variables are used to store words, phrases, sentences, graphic symbols and "numbers which are used like words."

By "numbers used like words" we mean numbers that will not be used in a calculation. Your social security number is an example of a number that is identified with a string variable instead of a numeric variable, because your SSN is used like a "label" instead of a "value."

Another good example is your **age**. If you ask the user to type his age for "reference" in a program, you might use a string variable because you will not be doing any calculation using his age. . .BUT. . .if you plan to calculate his date of birth by subtracting his age from this year, you are using age as a **number value** and must use a numeric variable. String variables take the same form as numeric variables, except they are followed by the **S-shaped dollar sign** ($). Examples of string variables are: A$, AB$, A1$, AB2$, and so on. Here are some examples:

Example 1

```
10 PRINT"ENTER A NUMBER":INPUTA
20 PRINTA
```

Example 2

```
10 PRINT"ENTER A WORD":INPUT A$
20 PRINTA$
```

Example 3

```
10 PRINT"ENTER A NUMBER":INPUT A
20 PRINT A"TIMES 5 EQUALS"A*5
```

Note in Example 3 that the MESSAGES or PROMPTS are INSIDE the quotation marks, while the variables are OUTSIDE. In line 20, you PRINTed A (the number you entered when prompted), then the message "TIMES 5 EQUALS," and then a CALCULATION (multiply the number A*5).

Calculations Make Practical Programs "Practical"

Calculations are important in most programs, from games to business aids. You have a choice of using either actual numbers or variables, when doing calculations inside a program, but if you're working with numbers supplied by the user you must use numeric variables. Begin by asking the user to type in two numbers, like this:

```
10 PRINT"TYPE 2 NUMBERS":INPUTA:INPUTB
```

Now multiply those numbers together to create a new variable C (C is number A

INCOME/EXPENSE BUDGET EXAMPLE

```
  5  PRINT" ♥ "                                             (clears the screen)
 10  PRINT"MONTHLY INCOME":INPUT IN                          (PRINT/INPUT statement)
 20  PRINT                                                   (Inserts blank line)
 30  PRINT"EXPENSE CATEGORY 1":INPUT E1$                     (Expense Cat 1=E1$)
 40  PRINT"EXPENSE AMOUNT":INPUT E1                          (Expense Amt = E1)
 50  PRINT                                                   (Blank line)
 60  PRINT"EXPENSE CATEGORY2":INPUT E2$                      (Expense Cat 2 = E2$)
 70  PRINT"EXPENSE AMOUNT":INPUT E2                          (Expense Amt 2 = E2)
 80  PRINT                                                   (Blank line)
 90  PRINT"EXPENSE CATEGORY 3":INPUT E3$                     (Expense Cat 3 = E3$)
100  PRINT"EXPENSE AMOUNT":INPUT E3                          (Expense Amt 3 = E3)
110  PRINT" ♥ "                                             (clear screen)
120  E=E1+E2+E3                                              (Add Expense Amts = E)
130  EP=E/IN                                                 (Calculate Expense/Income%)
140  PRINT"MONTHLY INCOME: $"IN                              (Display Income)
150  PRINT"TOTAL EXPENSES: $"E                               (Display Total Expenses)
160  PRINT"BALANCE EQUALS: $"IN-E                            (Display Income—Expenses)
170  PRINT                                                   (Blank line)
180  PRINTE1$"="(E1/E)*100"% OF TOTAL EXPENSES"              (Lines 180-200 calculate
190  PRINTE2$"="(E2/E)*100"% OF TOTAL EXPENSES"              % each expense amount is
200  PRINTE3$"="(E3/E)*100"% OF TOTAL EXPENSES"              of total expenses)
210  PRINT                                                   (Blank line)
220  PRINT"YOUR EXPENSES="EP*100"% OF YOUR TOTAL INCOME"     (Display E/I%)
230  FOR X=1 TO 5000:NEXT:PRINT                              (Time Delay Loop)
240  PRINT"REPEAT? (Y OR N)":INPUTY$:IFY$="Y"THEN 5:IFY$="N" THEN GO TO 250
250  PRINT" ♥ ":END
```

Adding Sound Effects

To use a sound effect, it's usually a good idea to include this line at the beginning of your program (it would normally start at line 10 as the first program line but we're using line 2 to add it to the beginning of our program above):

```
2 POKE36878,15:S1=36874:S2=36875:
S3=36876:S4=36877
```

Now you can use any of the VIC's four speakers by referring to S1, S2, S3 and S4. S1 is the deepest (lowest) voice and S3 is the highest (soprano). S4 is used for "white noise sound effects." Here is a sound effect you can add to your program above. Simply insert this line wherever you want a "beep" in your program (for example at Line 35):

```
35 POKES3,200:FORT=1TO200:NEXT=
POKES3,0
```

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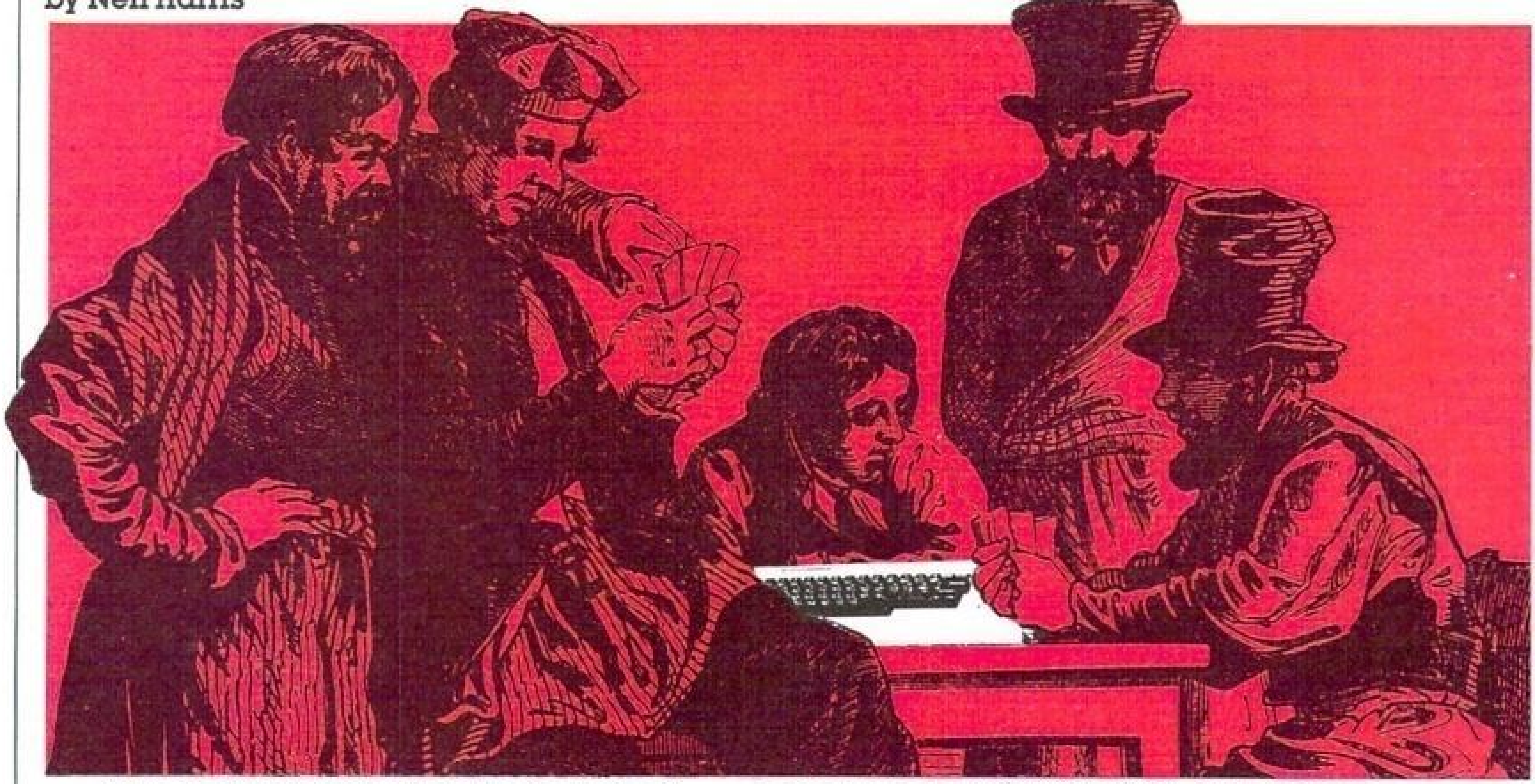
The Great Computer Rivalry

by Neil Harris



This age of high technology sure has complicated life. Oh, I know that computers make many things easier, from sending out phone bills to word processing to playing games. But getting together with my friends has turned into a battle.

You see, each of us owns a different brand of home computer. Now we spend more time debating the merits of our different systems than playing poker.

A couple of years ago, each of us settled on a brand we liked to work with. My choice was Commodore, and the first computer I used was the PET 2001. Others in the game got themselves computers named after fruit, or from the state that made Chainsaw Massacres famous, or from the makers of Pong, or one that became nicknamed Trash-80, or a little bitty one from a watch company.

In those days, we were more friendly about our rivalries. We were all pioneers, without much software and hardware support, without good documentation. It was possible then to spend our poker games enlightening each other. We shared BASIC tricks, and complained about the parts we lacked.

In the last year or two, the rivalry has escalated.

The first problem was with the marketing direction taken by the manufacturers of our machines. The Fruit computer company decided that business systems were where their future was. They developed more expensive equipment, which didn't work too well at first. My buddy with the Fruit computer became a vicious poker player, because he now needed the money to support his computer system. His machine plays great games, but for the money he's invested he could own an arcade by now.

The Chainsaw Massacre company shocked the owner of that machine by dropping the price from about $1000 to $200. Just when we stopped chiding him for buying just before the price drop, they announced their line of accessories. Boy, what they charge for extra memory! My friend is afraid to make a move. He thinks that, as soon as the company gets word that he plunked down his cash, they'll cut the price by 80% on that, too. He needs the extra memory to do almost anything, but he won't be able to face us if the worst happens.

The guy with the grown-up Pong machine takes a lot of abuse over his computer. It's the one with the flat plastic keyboard, like the cash register in McDonald's. If we're around when he's programming, all he hears is "Big Mac, fries, large coke!" He once asked me how much I paid for BASIC in my machine. I was incredulous: "You mean BASIC costs extra?"

Then there's my friend the Trashman. He bought his Model I back in the old days, even though we warned him. "You wouldn't buy a stereo from them, right?" When he wanted to expand the memory, he had to take his machine to the service center and leave it with them. Nobody else makes you do all that. His other problem is software; he can get OK software for business, but the games are lousy. He got the computer that works in color, but the calculator-style keyboard drives him crazy, and he can't even get good games for that.

The guy with the watch computer has trouble even talking to the rest of us. His hands look arthritic from trying to use the tiny keyboard. He does have BASIC commands right on the keyboard, but he usually just types the whole word rather than searching for a command. One day we discovered that you could see right through his machine when you hold it up to the light! And when he tries to play games, in black & white with no sound, the rest of us just shake our heads with sympathy. Some day he'll probably get a grown-up computer.

In the old days, I took my share of abuse over a small keyboard, over manuals that came out late. But lately my friends look at me differently. Each Commodore machine does something different, and does its job as well as you could hope. My CBM wordprocessor makes my Fruit computer friend turn as green as my CRT with envy. My VIC 20's games and BASIC frustrate the Chainsaw Massacre and Trash computer owners, who haven't got anything that compares to the games. And the guy with the Pong computer keeps talking about these two great games, Mac Pan and Star Riders (or something like that), but when we ask if any other games are any good, he just looks glum.

When I bought my VICMODEM, all my friends stopped talking to me for a while. It takes about $400 to run a modem on their machines, when you count interfaces and software that you need to make it work. My modem was only $109.95, including all that. In fact, for the price of their modems, they could get a VIC, tape deck, and a modem. A couple guys have held off on getting modems, and I think they're considering getting VICs just for that.

Finally, my friends decided to subject me to an inquisition. There must be, they thought, some weakness in my system.

"What's the BASIC like?" they asked.

"The same as in my PET. MicroSoft high level BASIC."

"Well," said the Chainsaw Massacre computer owner. "Mine has ANSI standard BASIC."

I didn't have to say anything, the Fruit owner hit him in the head. "Don't you know anything? ANSI standard defines *minimal* BASIC. MicroSoft can run rings around it."

"Oh. What about a disk drive?"

"I can get a VIC drive for $399."

"Mine is also $399," he said. "What about your disk controller?"

"It's built in."

"It is? But I have to pay $299 extra."

The Pong computer owner jumped in. "What's the capacity of the drive?"

"174,000 bytes."

He turned pale. His only has 88,000, and it uses so much of the computer's RAM that he had to void his warranty by purchasing a third party's memory to use it. I knew that my VIC drive holds more than any of them, even the expensive Fruit computer with only 143,000 bytes.

"How many dimensions per array?"

"As many as I need. How about you?"

Chainsaw and Pong got real quiet about this.

"Two," said Pong.

"Three," said Chainsaw Massacre.

"Tsk, tsk," I said.

"How about music?" asked the Trashman.

"3-part harmony plus white noise," I said. "And wait until I bring in the new Commodore 64. It has a synthesizer on one chip, built-in."

The Fruit computer owner looked ill now. Last year he got a special synthesizer system for his computer that set him back over $600. The 64 costs that much for the whole computer system.

"I have some questions for you, wise guys," I said. "How about upper and lower case letters? Keyboard graphics? Color controls?"

"Nobody likes a know-it-all", they said.

It's not my fault. I just took a careful look at what was available, and made the right choice.

Illustration by Jeff Gernsheimer

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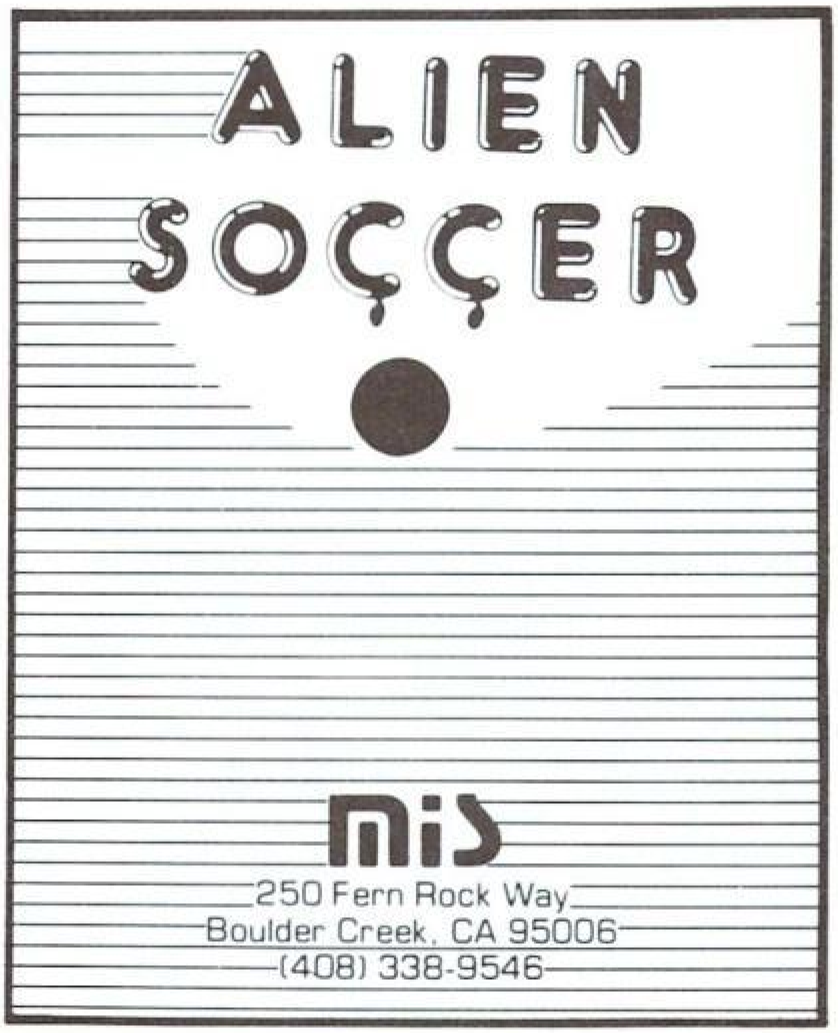

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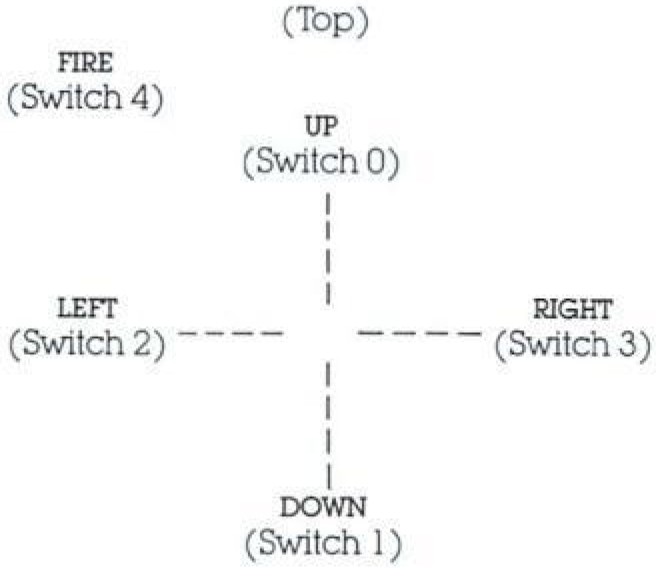
Once again programmer Bill Hindorff came through—this time with an excerpt from the forthcoming Commodore 64 Programmers Reference Guide. *(Yes, all 300-or-so pages of it.) This particular chapter should be of interest to all our game fanatics, who can now go bonkers with those terrific high-res graphics on the 64.*

Joysticks, Paddles, and Light-Pen

The Commodore 64 has two 9 pin Game Ports which allow the use of joysticks, paddles, or a light pen. Each port will accept either one joystick or one paddle. A light pen can be plugged into Port A for special graphic control, etc. . . Examples of using the joysticks and paddles from BASIC and machine language follow.

The digital joystick is connected to CIA #1 (MOS 6526 Complex Interface Adapter). This I/O device also handles paddle fire buttons and keyboard scanning. The 6526 has 16 registers which occupy memory locations 56320 thru 56335 inclusive ($DC00 to $DC0F). Port A data appears at location 56320 ($DC00) and Port B data is at location 56321 ($DC01).

A digital joystick is made up of five switches, four for direction and one for the fire button. The joystick switches are arranged as shown:



These switches correspond to the lower 5 bits of the data in location 56320 or 56321. Normally the bit is set to a one if a direction is NOT chosen or the fire button is NOT pressed. When the fire button is pressed, the bit changes to a zero (bit 4 in this case). To read the joystick from BASIC, the following subroutine may be used:

```
10 FORK=0TO10:REM SET UP DIRECTION STRING
20 READ DR$(K):NEXT
30 DATA"","N","S","","W","NW"
40 DATA"SW","","E","NE","SE"
50 PRINT"GOING...";
60 GOSUB 100:REM READ THE JOYSTICK
65 IFDR$(JV)=""THEN80:REM CHECK IF A DIRECTION
WAS CHOSEN
70 PRINTDR$(JV);" ";:REM OUTPUT WHICH DIRECTION
80 IFFR=16THEN60:REM CHECK IF FIRE BUTTON WAS PUSHED
90 PRINT"-----F-----I-----R-----E-----!!!":GOTO60
100 JV=PEEK(56320):REM GET JOYSTICK VALUE
110 FR=JVAND16:REM FORM FIRE BUTTON STATUS
120 JV=15-(JVAND15):REM FORM DIRECTION VALUE
130 RETURN

READY.
```

The values for JV correspond to these directions:

JV EQUAL TO	DIRECTION
0	NONE
1	UP
2	DOWN
3	—
4	LEFT
5	UP & LEFT
6	DOWN & LEFT
7	—
8	RIGHT
9	UP & RIGHT
10	DOWN & RIGHT

A small machine code routine which will accomplish the same task is as follows:

```
1000 .PAGE (JOYSTICK.8/5)  JOYSTICK - BUTTON READ ROUTINE
1010 ;
1020 ;AUTHOR - BILL HINDORFF
1030 ;
1040 DX=$C110
1050 DY=$C111
1060 *=$C200
1070 DJRR LDX #0      ;THIS ROUTINE READS AND DECODES THE
1080      LDY #0      ;JOYSTICK/FIREBUTTON INPUT DATA IN
1090      LDA $DC00   ;GET READING FROM PORT A
1100      LSR A       ;THE ACCUMULATOR. THIS LEAST
SIGNIFICANT
1110      BCS DJR0    ;5 BITS CONTAIN THE SWITCH CLOSURE
1120      DEY         ;INFORMATION. IF A SWITCH IS CLOSED IT
1130 DJR0 LSR A       ;PRODUCES A ZERO BIT. IF A SWITCH
IS OPEN
1140      BCS DJR1    ;IT PRODUCES A ONE BIT. THE JOYSTICK
DIR-
1150      INY         ;ECTIONS ARE RIGHT, LEFT, FORWARD,
BACKWARD
1160 DJR1 LSR A       ;BIT3=RIGHT, BIT2=LEFT, BIT1=BACKWARD,
1170      BCS DJR2    ;BIT0=FORWARD AND BIT4=FIRE BUTTON.
1180      DEX         ;AT RTS, DX AND DY CONTAIN 2'S
COMPLEMENT
1190 DJR2 LSR A       ;DIRECTION NUMBERS I.E. $FF=-1, $00=0,
$01=1.
1200      BCS DJR3    ;DX=-1 (MOVE RIGHT), DX=1 (MOVE LEFT),
1210      INX         ;DX=0 (NO X CHANGE). DY=-1 (MOVE
UP SCREEN).
1220 DJR3 LSR A       ;DY=1 (MOVE DOWN SCREEN). DY=0
(NO Y CHANGE).
1230      STX DX      ;THE FORWARD JOYSTICK POSITION
CORRESPONDS
1240      STY DY      ;TO MOVE UP THE SCREEN AND THE BACKWARD
1250      RTS         ;POSITION TO MOVE DOWN SCREEN.
1260 ;
1270 ;AT RTS TIME THE CARRY FLAG CONTAINS THE FIRE
BUTTON STATE.
1280 ;IF C=1 THEN BUTTON NOT PRESSED. IF C=0 THEN PRESSED.
1290 ;
1300 .END

READY.
```

Paddles

A paddle is connected to both CIA #1 and the SID chip (MOS 6581 Sound Interface Device) through a game port. The paddle value is read via the SID registers $D419 and $D41A. PADDLES CANNOT BE READ RELIABLY FROM BASIC ALONE!!!! The best way to use paddles, from BASIC or machine code, is to use the following

(continued on page 49)

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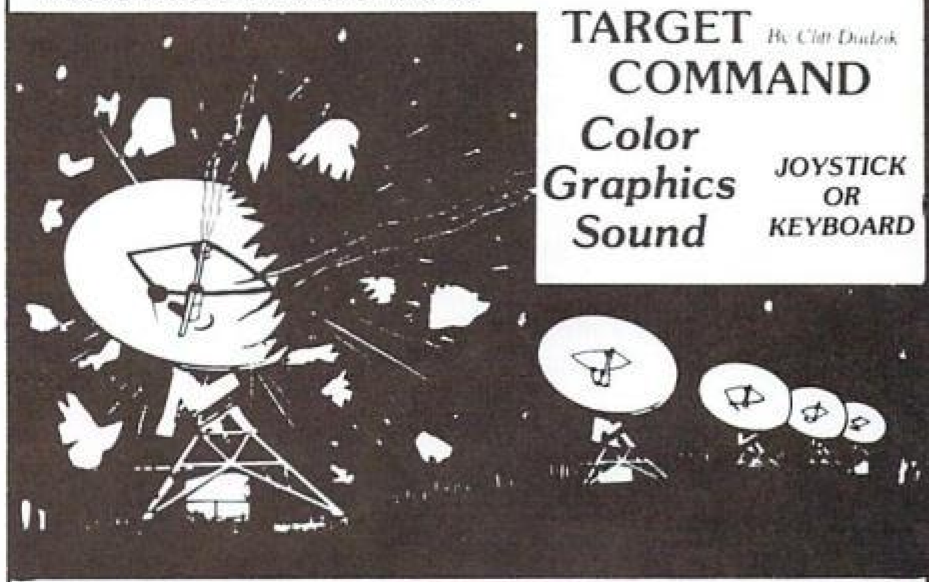

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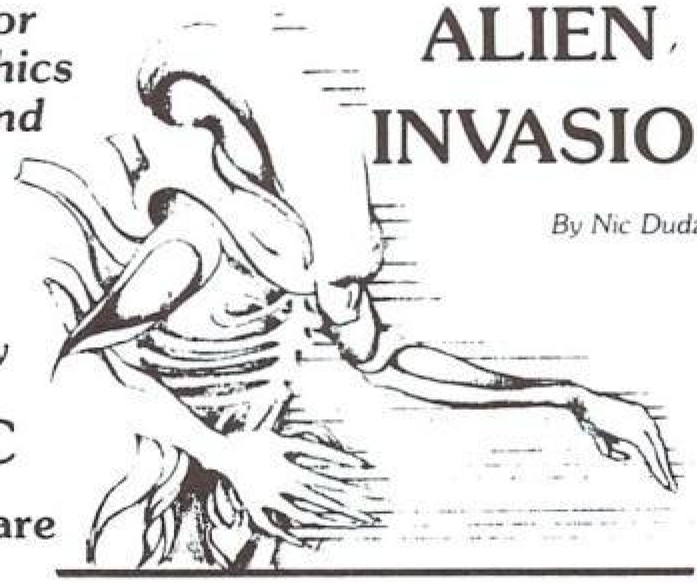

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COUPON CONTROL:

A Low-Cost Coupon Inventory Program for the VIC 20

by Doug Holub

My wife collects coupons. She's got over a hundred coupons for discounts on groceries, fast-food, car washes, you name it. I'll admit it's a little annoying to find rectangular holes cut out of the newspaper, and sometimes looking for the rest of a magazine article in the coupon file makes me mutter under my breath, but otherwise it's a perfectly harmless activity and potentially profitable.

Saving coupons is an effective way to keep the grocery bill down every week, but very often the amount of time and trouble required to keep track of a lot of coupons makes the savings look less attractive. Think about it: to make sure she uses the coupons she saves a housewife needs to read through her stack of coupons every week to remind herself what coupons she has. She also needs to keep track of expiration dates. The print on coupons is notoriously tiny and a person has to hunt for the expiration dates. Each coupon is handled many times before it is redeemed.

I saw the idea for a coupon inventory program in a computer magazine but that program required a disc drive and 32K and I really didn't think I could justify spending $500.00 to upgrade my system to fit the program. So, I wrote one for the set-up I had—a VIC 20 with 13K and a cassette recorder. I'm very pleased with it (and I'm prejudiced).

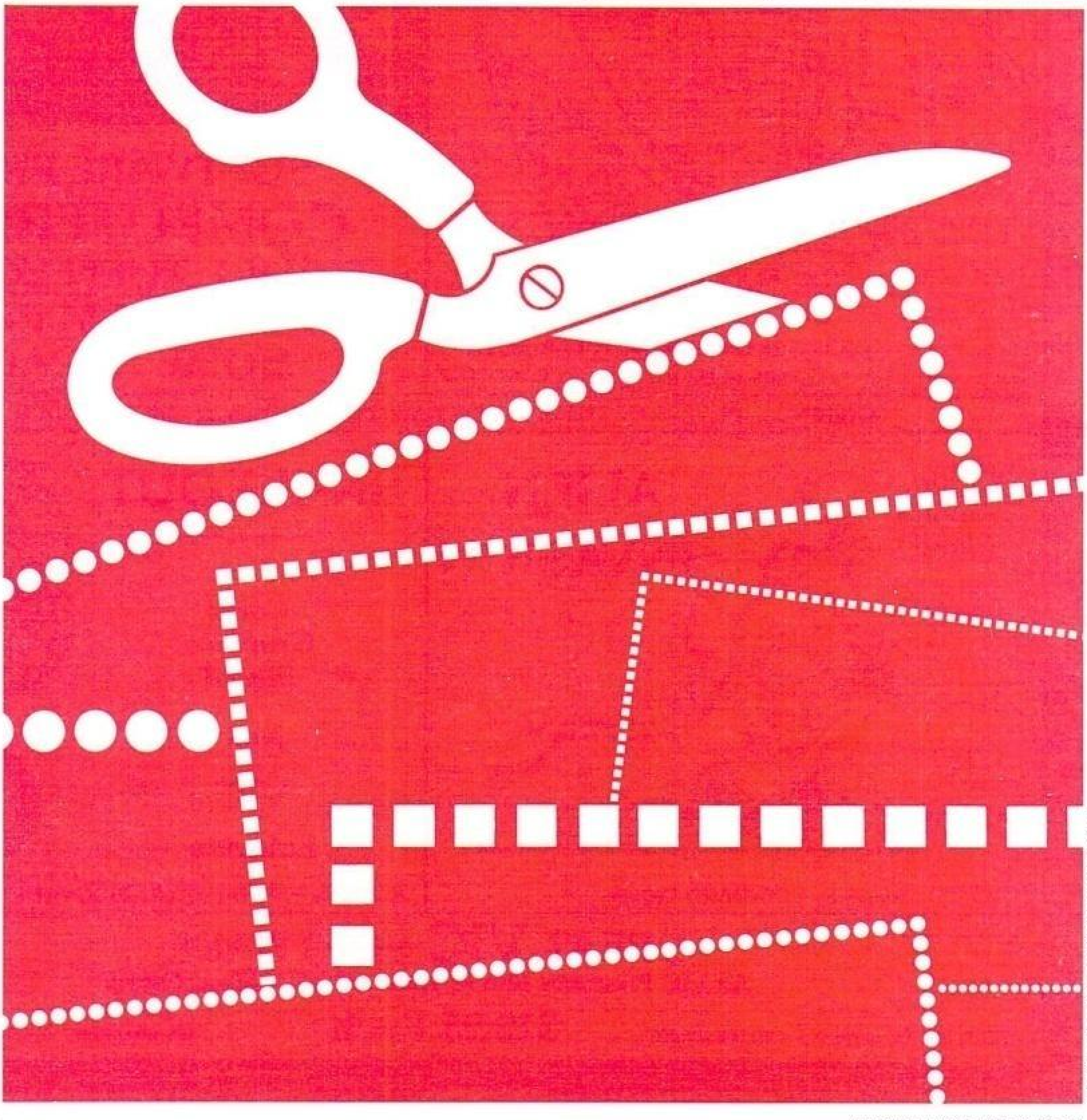

Illustration by Jacob Gernsheimer

Most database management programs store and retrieve information from a random access file on disc. In a matter of seconds the computer can read all the information on file and manipulate the data. (Technology is wonderful! It's a great day we're living in!) Storing and retrieving information with a cassette tape player goes much slower. It would take the computer about two minutes to read through my wife's 150 coupons if they were filed on cassette tape, and that's just one pass! If I decided I wanted the computer to search for another coupon after it just got done looking for some, I would have to rewind the tape and wait another two minutes. I think I could do it faster with my fingers and a file box!

For that reason I stored coupon information in DATA statements at the end of the program. The advantage is that now the computer can manipulate data as fast as it could with a disc drive. The disadvantage is that the program needs to be SAVED after each coupon searching session.

One interesting aspect of this program is the way the computer writes its own DATA statement program lines. The user never needs to LIST the program to add or delete DATA statements. Here's how the system works:

Whenever a housewife runs across a coupon during the week she cuts it out and puts it in the unclassified section of her coupon file box. Then once a week (more or less) she sits down at the computer terminal with all her unclassified coupons, LOADs the program, and types RUN. She sees

```
      COUPON CONTROL

    ADD A COUPON OR
    LOOK FOR A COUPON?
```

She wants to add coupons to her file so she hits "A" for "add." Then she sees

```
          COUPON CONTROL

BAKING          FAST FOOD
BEAUTY          FROZEN
BOXED FOOD      FUN
BREAD           HYGIENE
CANDY           MEAT
CANS            MEDICINE
CEREAL          PAPER-ETC.
CLEANING        SAUCE
DAIRY           SNACK
DRINK           MISC.

CATEGORY?
ITEM?
CENTS OFF?
EXPIRATION?
```

There are five pieces of information attached to each coupon filed in the computer: category, item, cents off, expiration date, and a coupon number. First the coupon is assigned to one of the twenty categories listed on the screen. For example, a 20¢-off coupon for Doritos would be assigned to the SNACK category. Next the computer asks "ITEM?" It's asking for the product's name or a description of it, i.e., "Doritos" or "taco corn chips". The expiration date is entered as a six-digit number. The first two digits represent the year, the next two the month, and the last two the day of the month. "October 31, 1983" would be written "831031". The computer assigns coupon numbers according to what category the coupon is in. All baking coupons are assigned numbers from 1200 to 1249; beauty coupons get 1250 to 1299; boxed food gets 1300 to 1349; etc.

Now comes the interesting part. This is what the screen displays next:

```
THE FIRST NUMBER IN THE
COMPUTER ENTRY BELOW IS
THE COUPON NUMBER.

WRITE IT ON THE COUPON
AND FILE IT.

THEN HIT 'RETURN'.

2142 DATA SNACK, DORITOS,.20,831031,2142
```

At this point the program is over and the VIC 20 is in edit mode. The cursor is positioned right on the coupon DATA statement line. When the user hits 'RETURN' the computer thinks she has just written a program line and entered it. Pretty slick, isn't it? To enter another coupon she types 'RUN' and repeats the process. (Are you wondering why the coupon number is the same as the program line number? Stay tuned.)

Now let's say it's Saturday morning and Mrs. Smith is about to do her weekly grocery shopping. She wants to check her coupon file against her shopping list to see if there are any coupons she can use, so she heads for the computer. The key to making this coupon inventory program a time saving tool is to not watch the computer as it LOADs and SAVEs the program. When someone makes a pot of coffee he doesn't watch it perk. When my wife does a load of wash she doesn't stare at the machine while it's washing the clothes. So Mrs. Smith has allowed herself about ten minutes to check her coupon file before she's ready to leave for the store. She turns on the computer, puts the cassette in the tape player, types 'LOAD', and hits 'RETURN'. Then she goes and looks for her car keys, or puts on some make-up, or rounds up the kids, or eats a donut. In a few minutes she's back at the computer and types 'RUN'. She sees

```
      COUPON CONTROL

    ADD A COUPON OR
    LOOK FOR A COUPON?
```

Since she wants to look for coupons she hits "L" for "look". Now the screen shows

```
             COUPON CONTROL
          TODAY'S DATE?
```

and Mrs. Smith enters a six-digit number for the date. Then she sees

```
             COUPON CONTROL
    BAKING          FAST FOOD
    BEAUTY          FROZEN
    BOXED FOOD      FUN
    BREAD           HYGIENE
    CANDY           MEAT
    CANS            MEDICINE
    CEREAL          PAPER-ETC.
    CLEANING        SAUCE
    DAIRY           SNACK
    DRINK           MISC.

    CATEGORY OR ITEM?
```

The program can search for coupons by category or by item. She types "C" for "category" and then the computer asks "WHAT CATEGORY?" When she enters "CLEANING" the screen begins to print stuff like—

```
IVORY        .20     1551
JOY          .15     1552
MR. CLEAN    .30     1554
EXPIRED
STAIN SPRAY  .25     1555
```

As the computer locates coupons in its memory it compares the expiration date in the DATA statement with the date entered at the start of the program. If the date in the DATA statement is less than the one entered by the user the computer prints "EXPIRED" under the coupon listing.

If Mrs. Smith sees a coupon she wants or one that is expired she jots down the number. When the computer is through listing all the coupons for a particular category it will ask again "CATEGORY OR ITEM?" and the user can continue searching for coupons by category or item name for as long as necessary. If the user wants to stop looking for coupons she hits "S" for "stop" and the computer prints:

```
IF YOU ARE GOING TO USE
ANY COUPONS, OR IF ANY
COUPON HAS EXPIRED,
TYPE ITS NUMBER AND HIT
'RETURN'.

(DON'T FORGET TO 'SAVE'
THE PROGRAM WHEN YOU'RE
DONE.)
```

Now the program is over and maybe you've figured out why the coupon number is the same as the line number of the DATA statement in the program. When the user types the coupon number and hits 'RETURN' he is actually writing a new line for the program, a line with nothing on it that replaces the DATA statement of the coupon that has been used or has expired. The coupon is now removed from the computer file.

Mrs. Smith found out everything she wanted to know so she types 'SAVE' and hit 'RETURN'. The list of numbers she has takes her directly to the coupons she wants in her file box. While the program is SAVing she goes and gets another donut.

If you don't have a disc drive for your personal computer and you want an easy-to-use coupon inventory program, here you go. If you don't feel like typing all of it into your computer, send me $3.00 and I'll send you the program on cassette.

PROGRAM REMARKS FOR "COUPON CONTROL"

Line #	
35	During the search loop this statement resets the "NONE" flag to 0.
86	This is the "NONE" flag. If a coupon has been located it keeps the computer from printing "NONE".
780	:FI=1 This raises a flag that prevents the user from entering a category name which is mispelled or which is not one of the categories that the computer recognizes.
796-834	These statements begin the subroutine that assigns coupon numbers according to category.
880	The computer spins in mini-loop here until it READS the DATA statement line number assigned to the category it's looking for.
890-930	Now the computer looks for a gap in the consecutive coupon numbers. For example, if coupons in BAKING had numbers 1201, 1202, 1203, 1205 the next number to be assigned to a coupon in the BAKING category would be 1204.
1200,1250 1300,1350 . . .,2150	These "dummy" DATA statements insure that the category-coupon-number markers don't get used. If actual coupons occupied these line numbers, the special category line numbers would be erased from the program when the coupon was removed from the file.

Coupon Control/Requires 8K Expander

```
READY.

5 PRINT"J":PRINT"   COUPON CONTROL"
6 PRINT"  ——————— ———————"
7 PRINT" ADD A COUPON OR         LOOK FOR A COUPON?"
8 INPUT AL$
9 IF AL$="A" THEN  720
13 PRINT"J":PRINT"   COUPON CONTROL"
14 PRINT"  ——————— ———————"
15 PRINT"TODAY'S DATE";:INPUT DA
16 GOSUB 1016
30 PRINT"CATEGORY OR ITEM NAME"
31 INPUT CI$:IF CI$="I"THEN 132
32 IF CI$="S"THEN 129
33 GOSUB 1016
35 Q=0
38 PRINT"WHAT CATEGORY?":PRINT
50 INPUT L$
80 READ D$,E$,F$,G,H%
82 IF D$="QUIT" THEN 95
86 IF D$=L$ THEN Q=1
87 IF D$=L$ THEN PRINT:PRINT E$,F$;TAB(15)H%
88 IF D$=L$ AND G<DA THEN PRINT"EXPIRED"
90 GOTO 80
95 IF Q=0 THEN PRINT"NONE■"
100 RESTORE:PRINT:GOTO 30
129 PRINT:PRINT"IF YOU'RE GOING TO USEANY COUPONS,
OR IF ANYCOUPON HAS EXPIRED,"
130 PRINT"TYPE ITS NUMBER  AND  HIT ■RETURN■."
131 PRINT:PRINT:PRINT"(DON'T FORGET TO ■SAVE■ THE PROGRAM
WHEN YOU  ARE DONE.)":END
132 INPUT"WHAT ITEM";L$
133 Q=0:PRINT
160 READ D$,E$,F$,G,H%
162 IF E$="QUIT" THEN 170
164 IF E$=L$ THEN Q=1
165 IF E$=L$ THEN PRINT:PRINT E$,F$;TAB(15)H%
166 IF E$=L$ AND G<DA THEN PRINT"EXPIRED"
168 GOTO 160
170 IF Q=0 THEN PRINT"NONE■"
171 RESTORE:PRINT:GOTO 30
720 GOSUB 1016
780 INPUT"CATEGORY";C$:FI=1
796 IF C$="BAKING" THEN FI=1200
798 IF C$="BEAUTY" THEN FI=1250
800 IF C$="BOXED FOOD"THEN FI=1300
802 IF C$="BREAD" THENFI=1350
804 IF C$="CANDY" THENFI=1400
806 IF C$="CANS" THEN FI=1450
808 IF C$="CEREAL" THEN FI=1500
810 IF C$="CLEANING" THEN FI=1550
812 IF C$="DAIRY" THENFI=1600
814 IF C$="DRINK"THEN FI=1650
816 IF C$="FAST FOOD" THEN FI=1700
818 IF C$="FROZEN" THEN FI=1750
820 IF C$="FUN" THEN FI=1800
822 IF C$="HYGIENE" THEN FI=1850
824 IF C$="MEAT" THEN FI=1900
826 IF C$="MEDICINE" THEN FI=1950
828 IF C$="PAPER-ETC."THEN FI=2000
830 IF C$="SAUCE" THEN FI=2050
832 IF C$="SNACK" THEN FI=2100
834 IF C$="MISC." THEN FI=2150
836 IF FI=1 THEN PRINT"NOT A CATEGORY":FOR T=1 TO 2000:NEXT T:GOTO720
840 INPUT"ITEM";I$:INPUT"CENTS-OFF";CO$:INPUT"EXPIRATION";EX$
850 J%=10000
880 READ D$,E$,F$,G,H%:IF H%<FI THEN 880
890 IF H%-J%>1 THEN LET NXT=J%+1
900 IF H%-J%>1 THEN GOTO 940
910 READ D$,E$,F$,G,J%:IF J%-H%>1 THEN LET NXT=H%+1
920 IF J%-H%>1 THEN GOTO 940
930 GOTO 880
940 PRINT"J":PRINT"   COUPON CONTROL":PRINT"   ——————— ———————"
950 PRINT" THE FIRST NUMBER IN  THE COMPUTER ENTRY
BELOW IS THE COUPON #.":PR INT
960 PRINT"WRITE IT ON THE COUPONAND FILE IT.":PRINT
970 PRINT"TO PUT THE ENTRY INTO THE COMPUTER.  HIT    ■RETURN■."
980 PRINT:PRINT"(DON'T FORGET TO ■SAVE■ THE PROGRAM WHEN YOU ARE DONE.)"
990 PRINT:PRINT:PRINT NXT;" DATA "C$","I$","CO$","EX$","NXT
1000 PRINT"TTTTTTT"
1010 END
1016 PRINT"J":PRINT"     CATEGORIES"
1017 PRINT"      ———————————"
1018 PRINT"BAKING","FAST FOOD"
1019 PRINT"BEAUTY","FROZEN"
1020 PRINT"BOXED FOOD","FUN"
1021 PRINT"BREAD","HYGIENE"
1022 PRINT"CANDY","MEAT"
1023 PRINT"CANS","MEDICINE"
1024 PRINT"CEREAL","PAPER-ETC."
1025 PRINT"CLEANING","SAUCE"
1026 PRINT"DAIRY","SNACK"
1027 PRINT"DRINK","MISC."
1029 PRINT
1050 RETURN
1200 DATA ,,,,1200
1201 DATA BAKING,CHOC-CHIP,.15,821130, 1201
1202 DATA BAKING,CHOC-CHIPS,.15,821130, 1202
1203 DATA BAKING,CHOC-CHIPS,.15,999999, 1203
1223 DATA BAKING,CHOC-CHIPS,.10,999999,1223
1245 DATA BAKING,SHAKE'N'BK,.25,999999,1245
1248 DATA BAKING,SALT&PEPPER,.10,999999, 1248
1250 DATA ,,,,1250
1251 DATA BEAUTY,L'EGGS,.25,830630,1251
1252 DATA BEAUTY,PANTYHOSE,.25,821231,1252
1253 DATA BEAUTY,PANTYHOSE,.25,821231,1253
1254 DATA BEAUTY,COSMETIC,.50,821231,1254
1300 DATA ,,,,1300
1301 DATA BOXED FOOD,KRAFT-EGG-NOODLE,.10,999999,1301
1302 DATA BOXED FOOD,HASH BROWNS,.20,999999, 1302
1350 DATA ,,,,1350
1351 DATA BREAD,ENGLISH-MUFFINS,.15,830430,1351
1352 DATA BREAD,BREAD-MIX,.15,830331,1352
1353 DATA BREAD,BISCUITS,.10,999999,1353
1354 DATA BREAD,BISCUITS,.10,999999,1354
1355 DATA BREAD,BISCUITS,.07,999999, 1355
1356 DATA BREAD,RAISIN BREAD,.15,830228, 1356
1400 DATA ,,,,1400
1450 DATA ,,,,1450
1452 DATA CANS,CAMPBELL'S-BEANS,.07,831031,1452
1453 DATA CANS,MUSHROOMS,.10,821231, 1453
1500 DATA ,,,,1500
1550 DATA ,,,,1550
1551 DATA CLEANING,IVORY,.20,999999,1551
1552 DATA CLEANING,JOY,.20,999999,1552
1554 DATA CLEANING,RUG VAC,.25,821231,1554
1555 DATA CLEANING,S.O.EZY,.10,999999,1555
1556 DATA CLEANING,MR.CLEAN,.10,999999,1556
1557 DATA CLEANING,MR.CLEAN,.10,999999,1557
1558 DATA CLEANING,DISHWASH,.15,821031, 1558
1559 DATA CLEANING,MR.CLEAN,.10,999999,1559
1600 DATA ,,,,1600
1601 DATA DAIRY,CHEESE,.15,999999,1601
1602 DATA DAIRY,CHEESE,.10,999999,1602
1603 DATA DAIRY,CHEESE,.12,999999,1603
1604 DATA DAIRY,CHEESE,.10,999999,1604
1605 DATA DAIRY,CHEESE,.15,999999,1605
1606 DATA DAIRY,CHEESE,.15,999999,1606
1607 DATA DAIRY,CHEESE,.15,999999,1607
1608 DATA DAIRY,CHEESE,.15,999999,1608
1609 DATA DAIRY,CHEESE,.10,999999,1609
1620 DATA DAIRY,CHEESE,.15,999999,1620
1650 DATA ,,,,1650
1651 DATA DRINK,HERBAL-T,.25,821231,1651
1652 DATA DRINK,COKE,25,9/30/82, 1652
1700 DATA ,,,,1700
1701 DATA FAST FOOD,BREAKFAST--MAC,FREE-BUY 1,820731,1701
1702 DATA FAST FOOD,CLARA'S PIZZA,1.00,820831,1702
1703 DATA FAST FOOD,CLARA'S PIZZA,1.00,820831,1703
1710 DATA FAST FOOD,BREAKFAST--MAC,FREE-BUY 1,820731,1710
1750 DATA ,,,,1750
1775 DATA FROZEN,MIXED-VEG.,.15,830131,1775
1800 DATA ,,,,1800
1801 DATA FUN,DIG'S,$1.00,820831,1801
1802 DATA FUN,DIG'S,$1.00,820831,1802
1803 DATA FUN,BOWLING,FREE,820901,1803
1804 DATA FUN,BOWLING,FREE,820901,1804
1810 DATA FUN,FITNESS,FREE,820901,1810
1850 DATA ,,,,1850
1852 DATA HYGIENE,WASH'N'DRI,.10,860630,1852
1853 DATA HYGIENE,SECRET,.50,999999,1853
1854 DATA HYGIENE,PADS,.20,830228,1854
1855 DATA HYGIENE,SPEED-STIK,.30,821231,1855
1856 DATA HYGIENE,PADS,.25,840331,1856
1857 DATA HYGIENE,FLOSS,.20,821231,1857
1858 DATA HYGIENE,PADS,.25,821231,1858
1859 DATA HYGIENE,SECRET,.35,999999,1859
1860 DATA HYGIENE,TAMPONS,.15,999999,1860
1861 DATA HYGIENE,SPEED-STIK,.15,821231,1861
1862 DATA HYGIENE,WASH'N DRI,.10,860630,1862
1863 DATA HYGIENE,PADS,.25,840331,1863
1875 DATA HYGIENE,PADS,.25,999999,1875
1900 DATA ,,,,1900
1901 DATA MEAT,CHICKEN,.10,830331,1901
1950 DATA ,,,,1950
1951 DATA MEDICINE,CO-TYLENOL,.15,830228,1951
1960 DATA MEDICINE,ANANCIN,.15,821031,1960
2000 DATA ,,,,2000
2001 DATA PAPER-ETC.,REYNOLDS-PLASTIC-WRAP,.25,821231,2001
2003 DATA PAPER-ETC.,GLAD-WRAP,.10,821231,2003
2004 DATA PAPER-ETC.,TRASH-BAGS,.25,821231,2004
2005 DATA PAPER-ETC.,TRASH-BAGS,.20,999999,2005
2006 DATA PAPER-ETC.,TRASH-BAGS,.15,999999,2006
2007 DATA PAPER-ETC.,TRASH-BAGS,.20,999999,2007
2008 DATA PAPER-ETC.,TRASH-BAGS,.20,999999,2008
2009 DATA PAPER-ETC.,KLEENEX,.10,999999,2009
2010 DATA PAPER-ETC.,KLEENEX,.10,999999,2010
2011 DATA PAPER-ETC.,KLEENEX,.10,999999,2011
2012 DATA PAPER-ETC.,BAGGIES,.10,850531,2012
2013 DATA PAPER-ETC.,REYNOLDS-WRAP,.15,821231,2013
2014 DATA PAPER-ETC.,TRASH-BAGS,.12,999999,2014
2016 DATA PAPER-ETC.,KLEENEX,.10,999999, 2002
2017 DATA PAPER-ETC.,PAPER-PLATES,.25,830930,2017
2025 DATA PAPER-ETC.,REYOLDS-WRAP,.10,821231,2025
2050 DATA ,,,,2050
2053 DATA SAUCE,MAYONAISE,.12,999999,2053
2054 DATA SAUCE,MAYONAISE,.12,999999,2054
2055 DATA SAUCE,TARTAR,.15,999999,2055
2060 DATA SAUCE,MAYONAISE,.12,999999,2060
2100 DATA ,,,,2100
2101 DATA SNACK,GRANOLA,.25,999999,2101
2102 DATA SNACK,WHEAT-THIN,.10,830630,2102
2103 DATA SNACK,GRANOLA,.20,999999,2103
2104 DATA SNACK,GRANOLA,.15,999999,2104
2105 DATA SNACK,CHEETOS,.12,999999,2105
2106 DATA SNACK,LAY'S,.19,999999,2106
2107 DATA SNACK,LAY'S,.12,999999,2107
2109 DATA SNACK,LAY'S,.19,999999, 2109
2125 DATA SNACK,CRACKERS,.12,830331,2125
2150 DATA ,,,,2150
2151 DATA MISC.,BOOKSHOP,2.00,820831, 2151
2152 DATA MISC.,CORN-OIL,.15,999999,2152
2153 DATA MISC.,CORN-OIL,.27,999999,2153
2154 DATA MISC.,BOOKSHOP,2.00,820831, 2154
2155 DATA MISC.,LIGHTBULBS,.25,821231,2155
3000 DATA QUIT,QUIT,QUIT,999999,3000
READY.
READY.
```

Deflection: A Video Game for Any Commodore Computer

by Neil Harris

One of the first programs I wrote on a PET, back in 1978, was a video game called *Deflection*. The program was based on a game first described in an issue of *Kilobaud* magazine (now called *Microcomputing*), and written in 8080 assembly language. I had seen the game working on a PET, but it was slow and full of bugs, so I wrote my own from scratch.

Recently, I was re-organizing my old diskettes, and I stumbled across this game once again. It had always been fun to play, but was written for the 40-column PET. My programming instincts got the better of me, and I decided to change the program so it would work on any of our machines.

The modifications only took 15 minutes. The program works by POKEing to the screen, and the main difference between Commodore computers is the location and size of the screen. The PET's screen has 25 lines of 40 characters each, with screen memory beginning at 32768. The CBM (and SuperPet) has 80 characters per line, starting in the same place. VIC 20's screen is 23 lines of 22 characters each, beginning (in an unexpanded VIC) at 7680. The Commodore 64 has 25 lines of 40, beginning at 1024.

Lines 1050 through 1053 set the factors for your machine. Omit the words REM and the machine name on the correct line. In other words, for a PET just erase the words REM PET from line 1051. For a Commodore 64, omit the REM 64 from line 1053.

Those of you with computers that can make sounds may want to add sound effects to this program. You should use different sounds for bouncing the ball off walls, deflectors, and blocks. Put sound effects on line 3400 for hitting a block, line 5200 for a wall, 2400 for one deflector, and 2500 for the other.

When youngsters play, you might want to change the messages in line 5600 to some a little less nasty.

The object of the game is to bounce a speeding ball into blocks placed at random on the screen. You bounce the ball by placing deflectors in its path. You must time the placement just right, and placing too many deflectors will make the ball bounce on a crazy path all around the screen.

On the PET and CBM, deflectors are created using the two slashes. On the VIC and Commodore 64, the backward slash was replaced by the English pound sign.

There is one subtle special feature in this program. The variable Z holds what I call the "fudge factor". Any time the person using the program types an inappropriate answer, like in line 1100, the fudge factor is increased. It also increases if the person uses the QUIT option to end a game. This factor is deducted from the score at the end of the game. If someone is good and types legitimate answers, they get a small bonus. If they were bad, their score goes down.

```
1000 REM--DEFLECTION BY NEIL HARRIS
1050 REM CBM SS=32768:WD=80:HT=25:SE=SS+WD*HT-1:POKE59468,12
1051 REM PET SS=32768:WD=40:HT=25:SE=SS+WD*HT-1:POKE59468,12
1052 REM VIC SS=7680:WD=22:HT=23:SE=SS+WD*HT-1:POKE36879,8
1053 REM 64 SS=1024:WD=40:HT=25:SE=SS+WD*HT-1:POKE53281,0
1100 Z=-10:INPUT"■■■INSTRUCTIONS";A$:
IFLEFT$(A$,1)="N"THEN1400
1200 IFLEFT$(A$,1)="Y"THEN4300
1300 Z=Z+10:GOTO4300
1400 INPUT"■TARGETS";A$:A=VAL(A$):IFA<1ORA>.
8*WD*HTTHENZ=Z+10:GOTO5000
1450 INPUT"■SPEED (0-9)";O4:IFO4<0THENZ=Z+10:GOTO1450
1500 PRINT"■";:FORL=0TOWD-1:POKESS+L,96:POKESE-L,96:NEXTL
1510 FORL=WDTO(HT-2)*WDSTEPWD:POKESS+L,96:
POKESS+WD+L-1,96:NEXTL
1530 IFA>440THEN5700
1550 FORL=1TOA
1600 X=INT(RND(1)*WD*HT)+SS:IFPEEK(X)<>32THEN1600
1700 POKEX,102:NEXTL
1750 FORL=SSTOSE:IFPEEK(L)<>32THENNEXTL
1800 F=0:T=A:P0=L:O0=L:D=SGN(RND(2)-.5):TI$="000000"
:IFRND(3)>.5THEND=WD*D
1900 NP=P0+D
2200 J=PEEK(NP):GETA$:IFJ=32THEN3100
2225 IFJ=96THEN5200
2250 IFJ=81THEN5250
2300 IFJ=102THEN3400
2350 GETA$:IFA$="Q"THEN5100
2400 IFJ=77THEN2800
2500 IFABS(D)=1THEN2700
2600 D=-D/WD:GOTO5250
2700 D=-WD*D:GOTO5250
2800 IFABS(D)=1THEN3000
2900 D=D/WD:GOTO5250
3000 D=D*WD:GOTO5250
3100 IFA$="Q"THEN5100
3150 IFA$="/"THENF=F+1:POKENP,78:GOTO1900
3200 IFA$="\"THENF=F+1:POKENP,77:GOTO1900
3300 P0=NP:POKEO0,32:FORO5=1TOO4*5:NEXT:POKEP0,81:O0=P0:GOTO1900
3400 T=T-1:IFT>0THEN3100
3500 PRINT"■■■YOU GOT";A;"TARGETS USING";F;"PADDLES"
3600 PRINT"■YOUR TIME WAS ";MID$(TI$,3,2);":";
RIGHT$(TI$,2);"■"
3700 R=16*LOG(A*15000/(F*F*VAL(TI$)/2))-Z-2*O4:PRINT
"YOUR RATING";R
3701 IFR<=0THENR=.1
3800 RESTORE:FORL=1TO10-R/10:READA$:NEXTL
3900 PRINT".. ";A$
3950 IFZ>90THENNEW
4000 INPUT"■ANOTHER GAME";A$:IFLEFT$(A$,1)="N"THENEND
4100 IFLEFT$(A$,1)<>"Y"THENZ=Z+10:GOTO3950
4200 GOTO1400
4300 PRINT"■THE OBJECT OF THE GAME
4400 PRINT"IS TO DEFLECT THE BALL
4450 PRINT"BALL THROUGH THE
4500 PRINT"TARGETS. ONCE THE LAST
4550 PRINT"TARGET HAS BEEN HIT
4575 PRINT"THE GAME ENDS.
4600 PRINT"■YOU DEFLECT THE BALL
4650 PRINT"USING THE \ AND /
4700 PRINT"KEYS.  ONCE A
4750 PRINT"DEFLECTOR IS CREATED
4800 PRINT"IT IS IN PLACE
4825 PRINT"PERMANENTLY.
4850 PRINT"■SPEED FACTOR OF ZERO
4875 PRINT"IS MAXIMUM."
4900 PRINT"■HIT Q AT ANY TIME
4950 PRINT"TO QUIT"
5000 PRINT"■YOU MAY CHOOSE FROM
5050 PRINT"1 TO"INT(.8*WD*HT)"TARGETS":GOTO1400
5100 Z=Z+20:PRINT"■YOU QUIT":GOTO4000
5200 D=-D:P0=NP:NP=P0+D:GOTO2200
5250 P0=NP:GOTO1900
5500 DATAAMAZING,PROFESSIONAL,"VERY GOOD",FAIR,
"KEEP PRACTICING","TRY HARDER"
5600 DATAWIMP,SPAZZ,"TRY A DIFFERENT GAME"
5700 FORL=SS+WDTOSE-WD:IFPEEK(L)<>32THEN5900
5800 POKEL,102
5900 NEXTL
6000 FORL=0TO.8*WD*HT
6100 X=INT(RND(1)*1000)+32768:IFPEEK(X)<>102THEN6100
6200 POKEX,32:NEXTL
6300 GOTO1750
```

CONGRATULATIONS TO COMMODORE CHALLENGE CONTEST WINNER

James Dunn
of Dallas, Texas
for "Wheel of Gold"

We received a slew of superb software from our talented readers over these past few months, but, unfortunately, could choose only one winner. Many thanks to all of you who submitted programs. They were all terrific! And keep up the good work. Who knows. . . maybe next time the winner will be YOU! Meanwhile, look for James' program listing in the next issue of *Power/Play*. You'll enjoy playing Wheel of Gold!

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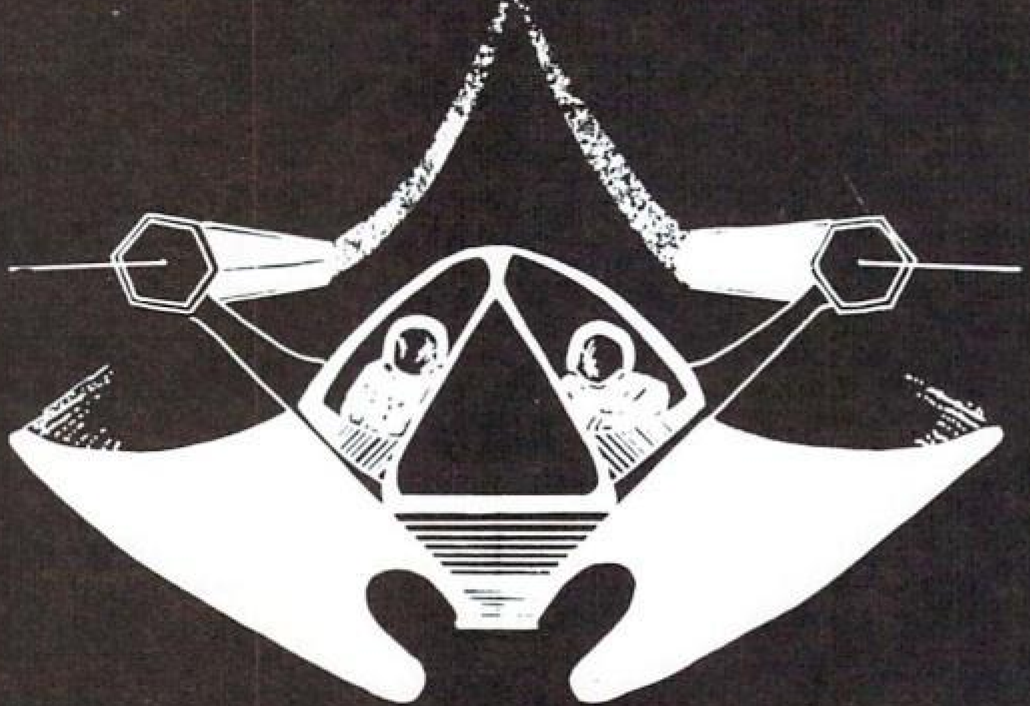

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Knowledge Applied—A Joystick Version of Slither

by Paul D. Zander

***(Editor's Note:** Although Commodore's newest version of Slither can be used with a joystick, the older versions were designed for keyboard only. Our readers who own that older version and would like to use a joystick to play can now modify the program using Paul's suggestions here—and may learn something in the process.)*

One Sunday afternoon not long ago, a friend and I were passing the time with a game of Slither on my VIC. Slither is one of the programs available in Commodore's "Recreation Pack". Earlier, we had been playing VIC Avengers using a joystick, and my friend wondered why Slither required us to use the keys to input direction commands, instead of the joystick.

Later in the week, with the help of Andy Finkel's article "Joystick Control on the VIC" from the first issue of *Power/Play*, I transformed Slither into a joystick game. It is an easy and uncomplicated transformation. There are more sophisticated ways to change the game. But, to keep things simple, here's what you can do.

First, LOAD Slither from cassette and LIST the program. Then add this housekeeping statement:

```
101 POKE 37139,0:DD=37154:PA=37137:PB=
37152
```

Then replace the manual keyboard INPUT statement 200 with the following subroutine call:

```
200 GOSUB 9000
```

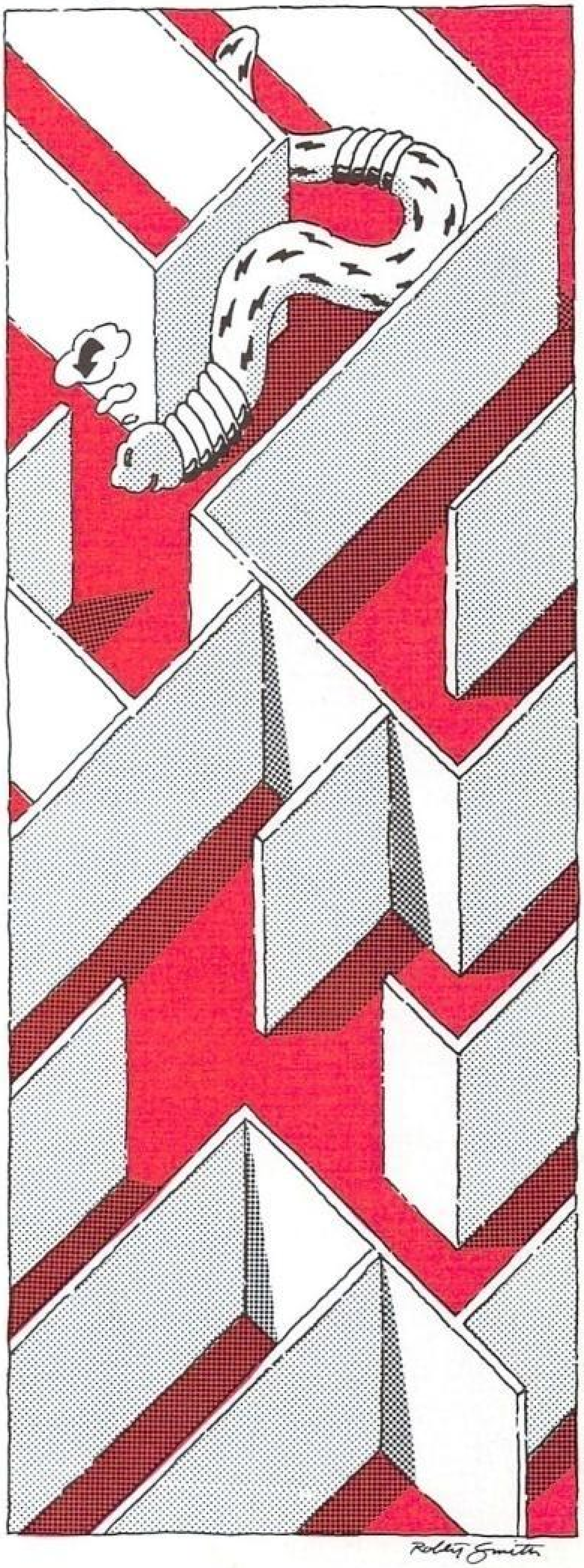
The subroutine simply obtains the joystick value and changes it to one of the I,J,K,M direction keys. After the subroutine, the program continues normally. Here's the routine:

```
999 END
9000 DZ=PEEK(DD):POKEDD,O:S3=-((PEEK
(PB)AND128)=0):POKEDD,DZ
9001 Z$="L"
9010 IF S3<>0 THENZ$="K":GOTO9100
9020 PZ=PEEK(PA):S1=-((PZ AND 8)=0)
9025 IF S1<>0 THEN Z$="M":GOTO 9100
9030 S2=((PZ AND 16)=0)
9035 IF S2<>0 THEN Z$="J":GOTO 9100
9040 S0=((PZ AND 4)=0)
9045 IF S0<>0 THEN Z$="I"
9100 RETURN
```

Be careful, by the way, with your joystick movements. An accidental diagonal move may send your Slither worm crashing into itself! If you want to clean up the instructions printed at the beginning of the program to reflect joystick control, delete lines 40 and 41, and change line 30 to:

```
30 PRINT" (CLR) GUIDE THE MOVING
WORM WITH YOUR JOYSTICK"
```

You'll want to save a copy of your new, improved Slither on one of your own tapes. If you can grasp all these changes and why they are made, you'll be ready to tackle Super Slither on the flip side of Slither.



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V 70 COUNTRIES
This is an educational program which tests to see if you know the location of various countries in the world. Jr. H.S. and up. $9.95

V 71 LETTER SEQUENCE
One letter of the alphabet will be blanked out and you must type in the missing letter. Preschool and Kindergarten. $7.95

V 72 SILENT LETTERS
The computer displays a word on the screen, and the student must choose the silent letters in the word. Elem. $7.95

V 74 LETTER MATCHING
The computer gives you the small letter and you must type in the matching capital letter. Preschool and Kindergarten. $7.95

V 75 GUESS MY NUMBER
You must guess the computer's number which is from 1 to 100, in as low a number of moves as possible. $7.95

V 76 SPELL
Here you tell the computer the words you have trouble with. The computer scrambles the words and you must spell them correctly. $9.95

V 77 LETTERS
You must guess the letter which the computer is thinking of. The computer gives clues if you guess wrong. $7.95

V 78 BRICK
The computer has a brick float across the screen and it disappears before it hits the window. You have to stop the brick before it breaks the glass. $7.95

V 79 SHOOT
You have to shoot a moving object. The game has five different skill levels. $7.95

V 80 REVERSE
This game is played with two sets of pegs. The board starts with a set of pegs at each end and you must reverse them. $7.95

V 81 CAPTURE
You have to capture the two beasts by containing them in the brick cage that you build. It has nine skill levels. $9.95

V 82 WORLD CAPITALS
An entertaining and educational variation of STATE CAPITALS. $9.95

V 83 JACKPOT
You must see this one armed bandit in action to believe it. Full color graphics and sound. $7.95

V 84 STATE CAPITALS
The computer displays a state or capital, the student types in the coresponding capital or state. Even corrects spelling mistakes. $9.95

V 85 HANGMAN
Unbelievable graphics and sound with a twist of humor. Kids of all ages will love this one. $9.95

V 86 TIC-TAC-TOE
The perennial favorite, a fast-paced colorful game. Try if you can to beat the VIC. $7.95

V 87 MEMORY
The VIC challenges your memory to the ultimate degree. Just like the old T.V. show Concentration. $9.95

V 88 MATCH
Hand and eye coordination are a must in this game. Beat the clock and get the maximum number of points. $7.95

V 89 MONKS
A devilish game of logic. It will have you glued to the VIC for days. $7.95

V 90 MOSAICS
A variation of Rubics cube for the VIC. This game has never been seen before for any computer. We wrote the program but could not solve the puzzle. $9.95

V 92 MAGIC PAD
A mini version of Visi-Calc for the VIC. Allows storage and retrieval of data from cassette; invaluable for personal and business use. Turns VIC into the perfect record keeper. $20.00

V188 HIGH RES. DOODLE-JOYSTICK
Use the joystick to draw high resolution pictures on a 64 dot screen. You can save to a tape for future viewing. Special graphic functions and reverse picture and reverse section. $7.95

V189 HIGH RES. DOODLE-KEYBOARD
This program allows you to draw high resolution pictures through keyboard control $7.95

V190 BIORHYTHM
Just like the biorhythm charts you find in books. $9.95

V191 BLACKJACK
Just like Blackjack in the casinos. $14.95

V185 MATH DICE
This program displays the dice on the screen and you must tell the computer the correct sum of the dice. Elem. $9.95

V186 ROOT FINDER
Finds roots to complex polynomials. $5.95

V187 TUTOR MATH
This program is designed to help students with adding and subtracting signed numbers. $9.95

VIC - 20 SOFTWARE

ORDER TODAY

VIC-20 is a trademark of Commodore Business Machines.

AMERICAN PERIPHERALS

122 BANGOR STREET
LINDENHURST, N.Y. 11757
516 - 226-5849

V107 BINARY NUMBERS
This program is designed to introduce you to the binary number system and the conversion to binary from base 10 numbers and back. $9.95

V108 BOMBER
You must decide who you want to fly for. You then get to pick a target and your experience level. $9.95

V151 BIZZ-BUZZ
Math game that tests the student on division by 2&3. Good for elementary school students. With color and sound. $9.95

V152 MISSILE COMMAND
You have three bases and you must destroy as many space ships as you can before you run out of missiles. $9.95

V153 TANK VS. UFO
The tank is moving back and forth along the base and you must shoot the UFO before it shoots you. $9.95

V156 ACEY DEUCEY
This is a game in which the computer deals two cards face up and you must bet on whether or not the next card will have a value between those first 2 cards. $9.95

V180 ARTIST
This program allows you to draw a picture on the screen and then save it for another day. $4.95

V184 HEX MONITOR
This program allows you to enter codes in hexadecimal directly from basic. It will also convert decimal to hexadecimal or hexadecimal to decimal. $9.95

V192 BEST STRAIGHT LINE
This program finds the equation for the best straight line through the desired points on a graph. $9.95

V194 SNAKMAN
Pacman for the VIC. $19.95

V197 ASTROBASE-2001
Destroy the alien invaders from space as they attack your planet. $14.95

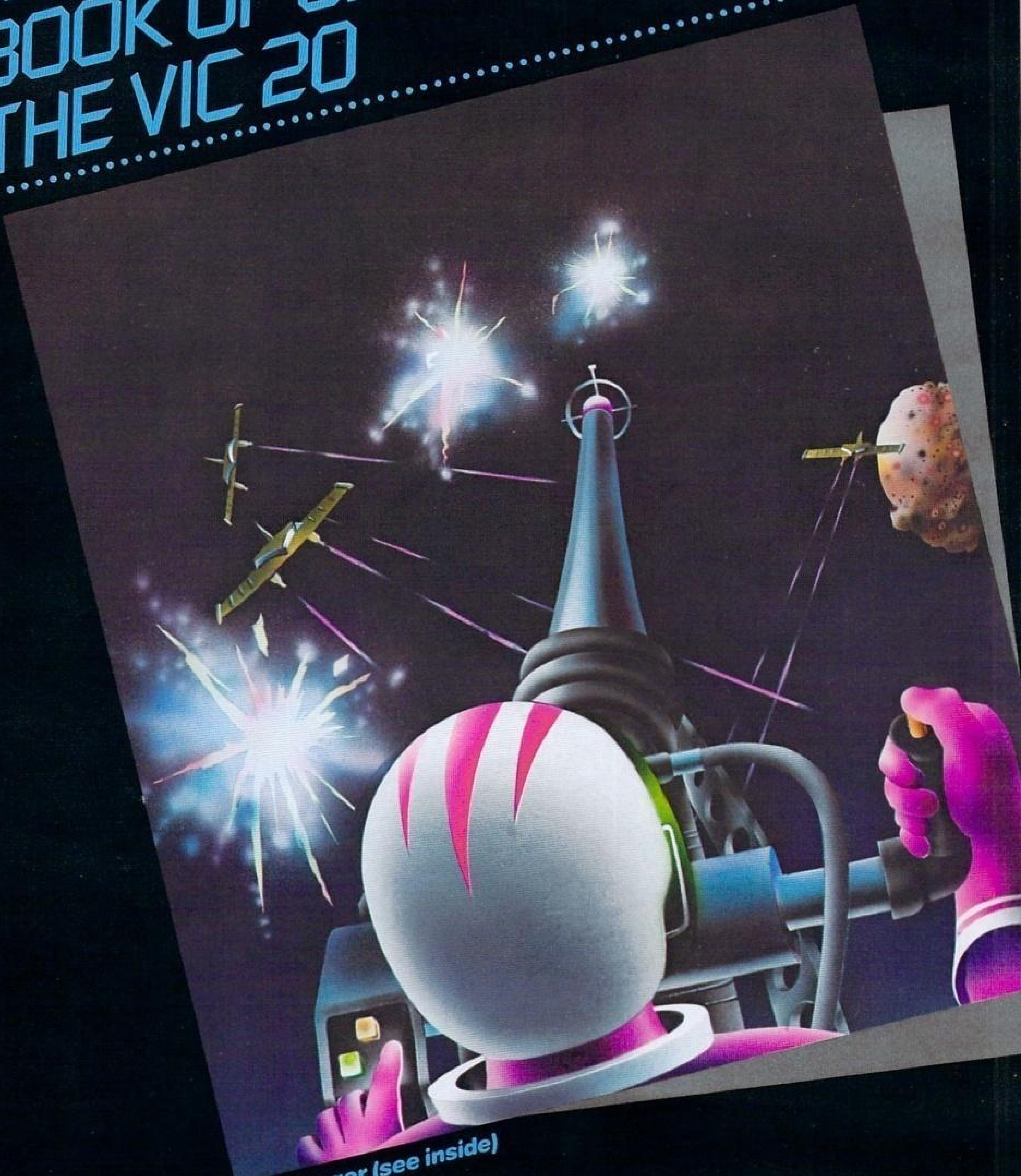
V 61 IDENTIFYING COMPLETE SENTENCES
A group of words are presented on the screen. The student must identify whether or not it is a complete sentence. $7.95

V 62A TYPE TO READ SET A
Set A introduces short vowel sounds between single consonants. 15 tapes $105.00

V 62B TYPE TO READ SET B
Set B focuses on consonant clusters at the beginnings and ends of words. 17 tapes. $119.00

Please send me the
VIC 1982 CATALOG
AMERICAN PERIPHERALS
122 Bangor Street
Lindenhurst, NY 11757
NAME ____________________
ADDRESS ____________________
CITY ____________ STATE ____________
ZIP ____________ COMPANY ____________

COMMODORE'S BOOK OF GAMES FOR THE VIC 20



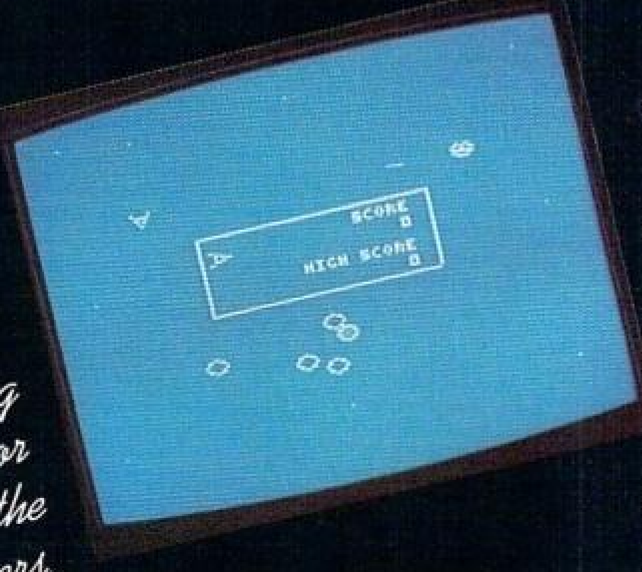
VIC Avenger (see inside)

GAMES ON CARTRIDGE

Available from Commodore for the VIC 20

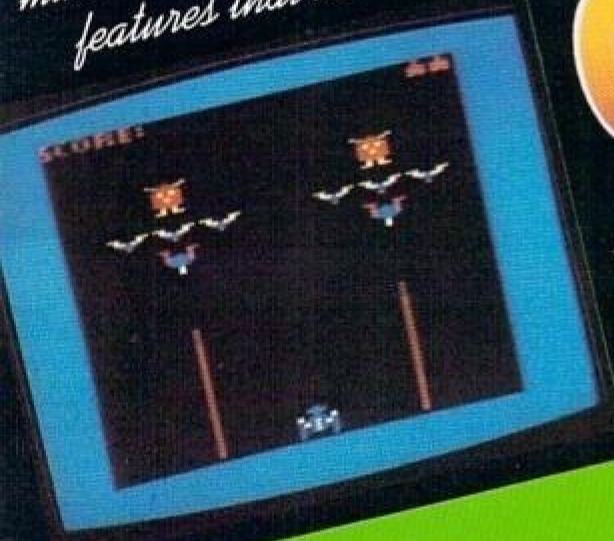
TRY THESE BALLY/MIDWAY ARCADE CLASSICS

OMEGA RACE



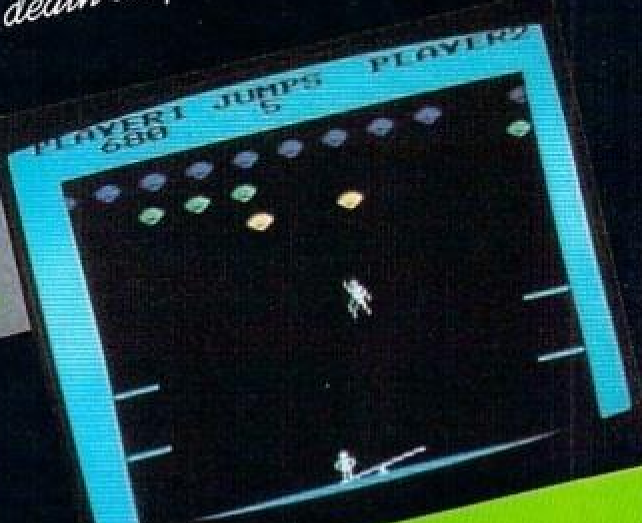
The ultimate space game. You've got one Omegan fighter maneuvering against droid ships, command ships, death ships, photon mines and vapor mines. Fantastic "rubber band" boundaries, multiple levels of difficulty—all the features that make the Bally/Midway game so successful. One or two players.

GORF



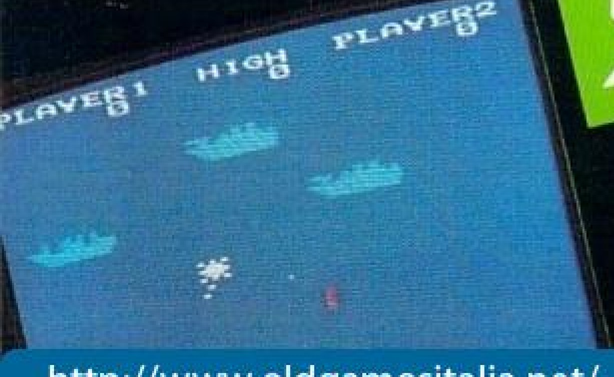
Midway's incredible coin-operated game includes four completely different games, multiple levels of difficulty, some of the best cartoon graphics ever devised for video games. Invaders, gorfies, death ships, saucers, aliens. It's terrific!

CLOWNS



Come one, come all! See the amazing jumping clowns direct from their show-stopping Bally/Midway arcade tour! A true arcade classic. Colorful acrobatics with high-scoring skill.

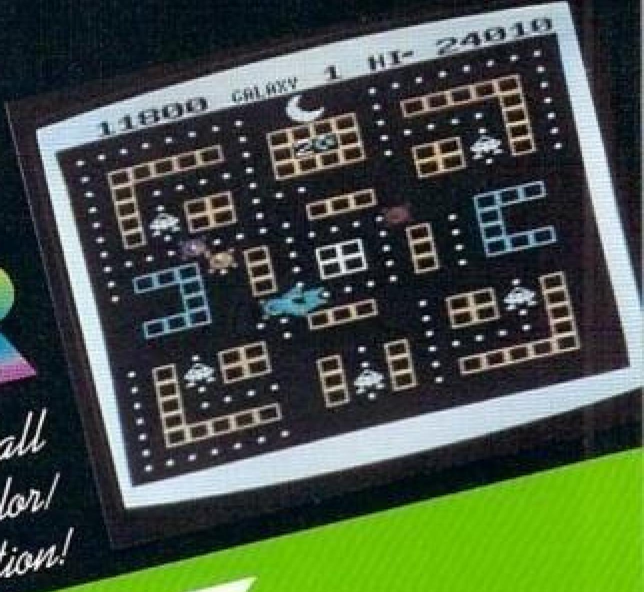
SEA WOLF



As submarine commander you are in charge of sinking and destroying all enemy ships—destroyers, freighters and P.T. boats. An explosive Bally/Midway classic. Fast action fun!

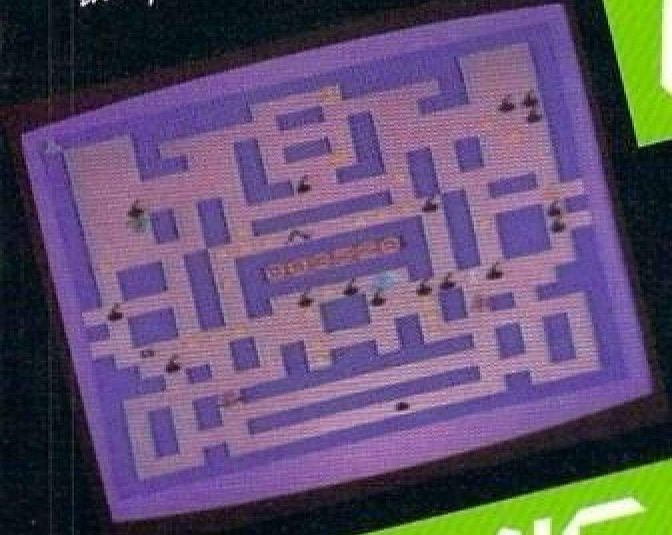
# NEW
FROM
COMMODORE!!!!

COSMIC CRUNCHER



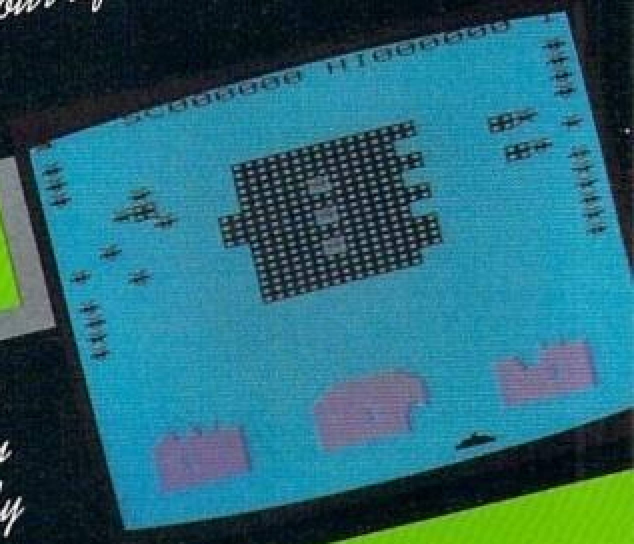
Maneuver your "Cosmic Cruncher" through the Milky Way and "crunch" all the pulsars in the galaxy. Eleven challenging levels of play, over 300 color/maze combinations. Exciting arcade action!

GARDEN WARS



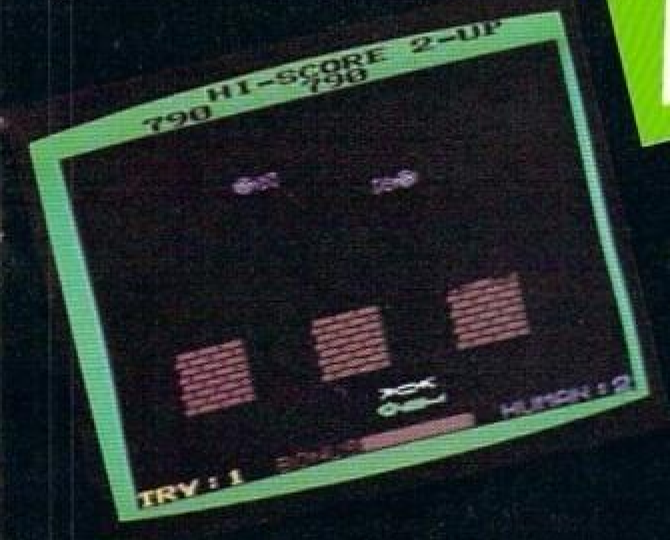
Get your mouse through the deadly garden filled with enemies—caterpillars, snakes, snails and spiders. This is no "Garden of Earthly Delights"! Squirm, dodge and run for your life through the maze-like garden. Fast arcade action.

COSMIC JAILBREAK



Three deadly criminals are trapped behind bars. Can you keep them in? There's a conspiracy against you—you are constantly under attack—but you must keep the jailbreak from occurring! FIFTEEN levels of play, increasingly fast action.

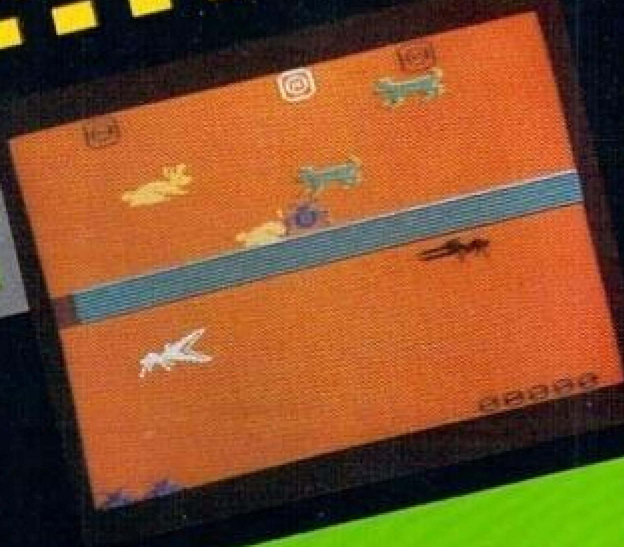
MONEY WARS



Lights flash, shots ring out! Can you escape or are you trapped? Look out, someone is shooting at you from the sky! Grab the money and RUN! Increasingly difficult levels of play, exciting action.

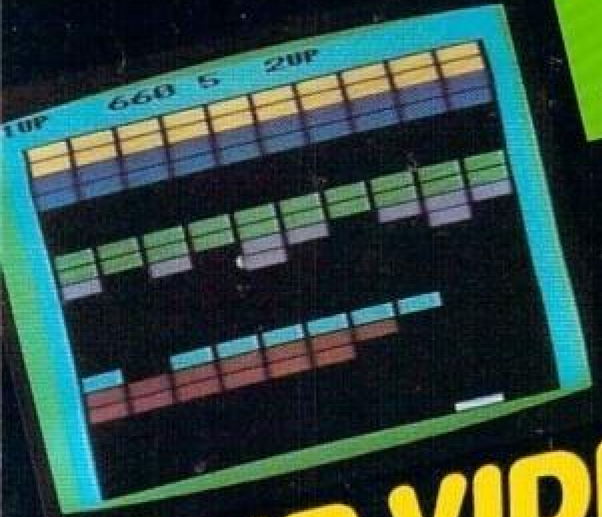
MORE NEW GAMES ON CARTRIDGE!! For the VIC 20

MENAGERIE



Maneuver your flea through the deadly spider swamp and on to the mystical wall for a brief rest. Quickly hitch a ride on one of the travelling menagerie of animals for the final trek through the desert.

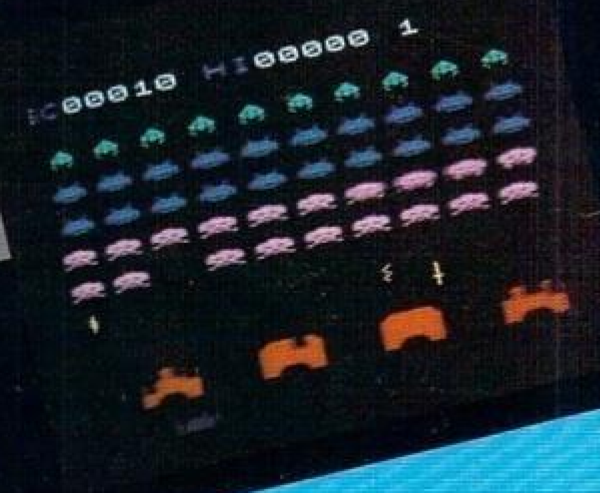
SUPER SMASH



The World Championship is at stake! As a finalist, do you have the cat-like reflexes to return the speeding ball and take the crown? On your toes—this is raquetball at its toughest!

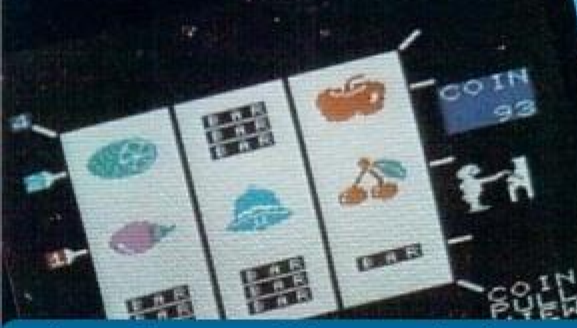
YOUR VIDEO ARCADE FAVORITES for the VIC 20 on cartridge

VIC AVENGER



It's an invasion of space intruders, and you're the VIC "Avenger". Space action for arcade enthusiasts.

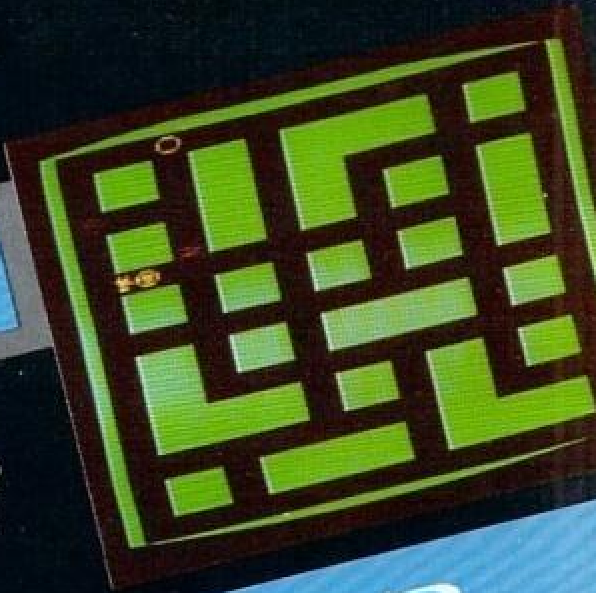
SUPERSLOT



Colorful slot machine game works just like the real thing! Great music and sound effects.

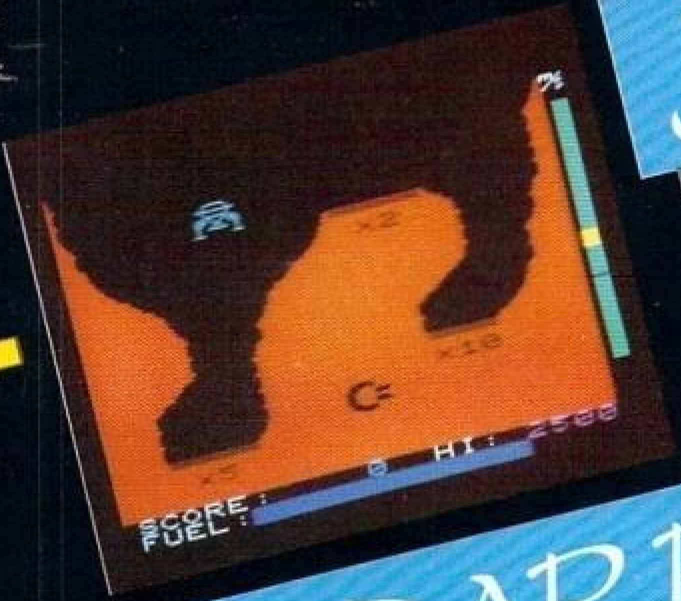
MORE FAVORITES on cartridge . . .

VIC SUPER ALIEN



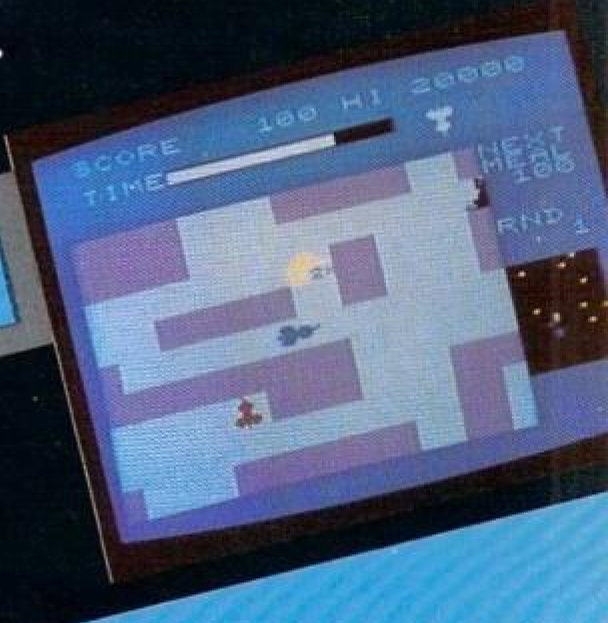
You're trapped in a maze, and your only defense is the "alien buster". Can you capture the aliens before they zap you?

JUPITER LANDER


x2
x10
x5
SCORE:
FUEL:
HI: 2500

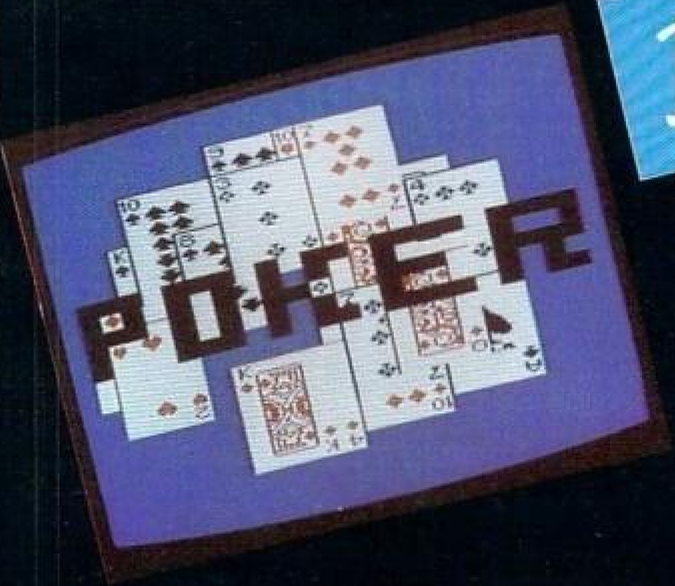
Pilot your Jupiter Lander through the treacherous crevices of a mysterious planet. Variable rocket thrust, anti-gravity, horizontal retros.

RADAR RAT RACE


SCORE
100
HI
20000
TIME
NEXT
MEAL
100
RND 1

The magical mouse maze makes for a fast-paced, challenging game of wit, strategy and reflexes. Excellent graphics.

DRAW POKER



Casino-style poker recreates the real thing! Superb animation and sound effects add to the fun, mystery and luck.

AND EVEN MORE FAVORITES on cartridge . . .

MIDNIGHT DRIVE/ROAD RACE

Authentic night driving simulation provides thrills, chills and . . . spills? An unusual computer challenge.

RAID ON FORT KNOX

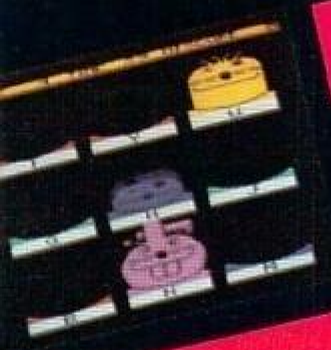
You're scurrying through a complex of tunnels below Fort Knox. Just ahead you spot the gold! Now grab it and try to escape before the guards find you!

CHILDREN'S SERIES on cartridge

Fun for grownups, too!

THE SKY IS FALLING

Help Chicken Little by catching pieces of the falling sky! A great "first" game to teach motor skills.

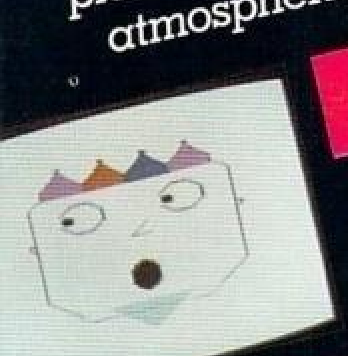


MOLE ATTACK

A colorful cartoon action game. Keep those nasty moles underground! How many can you clunk before time runs out?

VISIBLE SOLAR SYSTEM

Astronomy buffs love this game-science-learning tool. Journey to the major planets of our solar system, learn key statistics about each planet. Or record atmospheric conditions and compare planetary statistics using "Astro Calc".

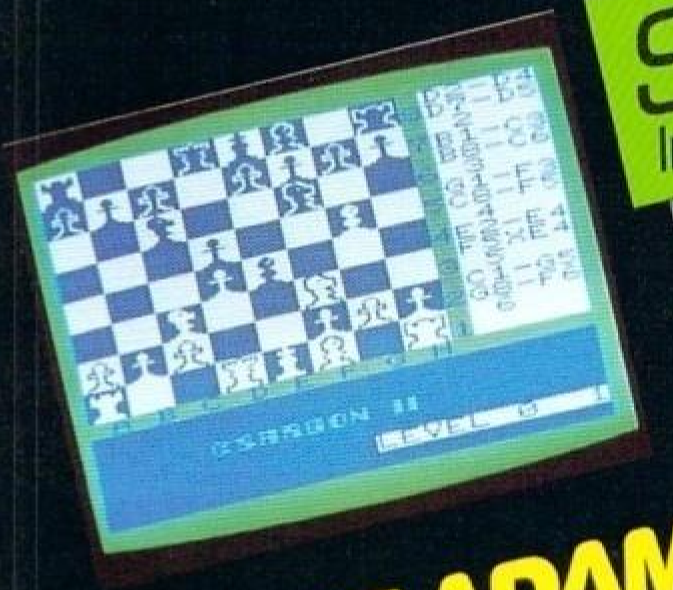


HOME BABYSITTER

Three preschool game programs help teach counting, the alphabet and relationship skills. The parents' manual helps you help your child.

BINGO/SPEED MATH

Two learning games in one. Learn to add, subtract, multiply and divide while having fun.


SARGON II
LEVEL

SARGON II CHESS

In a class by itself!

SEVEN challenging playing levels in this one, called the BEST microcomputer chess game by experts. Makes the VIC a challenging chess opponent.

SCOTT ADAMS ADVENTURE GAMES

Challenging fantasy games take you through the mythic realms of your own mind, seeking treasure and escape.

ADVENTURE LAND ADVENTURE

Wander through an enchanted world trying to find the 13 lost treasures. You'll encounter wild animals, magical beings and many other perils and puzzles. For beginning Adventurers and veterans alike.

PIRATE COVE ADVENTURE

Meet up with the Pirate and his daffy bird, and encounter many strange sights as you try to go from your London flat to Treasure Island. Can you recover Long John Silver's lost treasure?

MISSION IMPOSSIBLE ADVENTURE

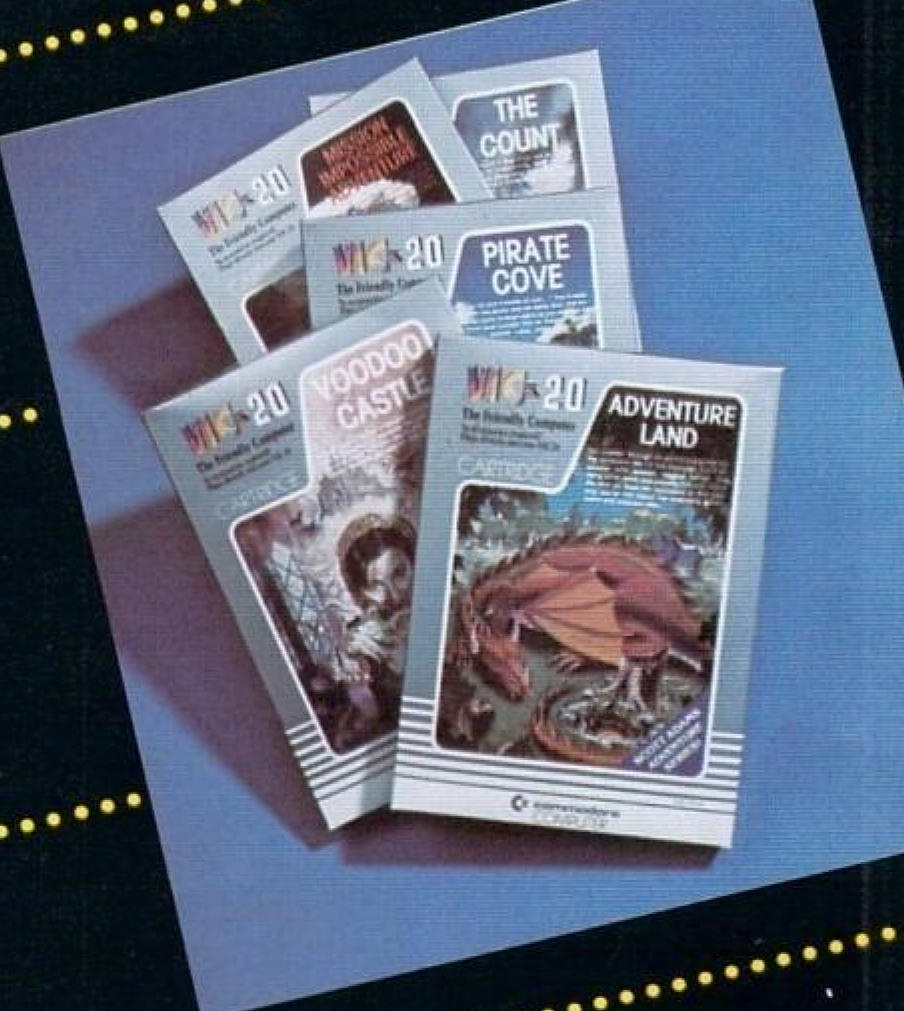
Can you complete your mission in time? Is the world's first automated nuclear reactor doomed? This one "radiates" excitement!

THE COUNT

You wake up on a large brass bed in a Transylvanian castle. Who are you, and what are you doing here? And WHY did the postman deliver a bottle of blood? It's love at first byte!

VOODOO CASTLE

Count Christo has a fiendish curse put on him by his enemies. There he lies, and you are his only hope! Can you rescue him?


VIC 20
The Friendly Computer
MISSION IMPOSSIBLE ADVENTURE
THE COUNT
PIRATE COVE
VOODOO CASTLE
ADVENTURE LAND
CARTRIDGE
commodore COMPUTER

GAMES ON TAPE

Use these games with your Commodore datassette tape recorder. All six available in Commodore's Recreation Program Pack.

Car Chase: Fast-paced road action
VIC 21: Casino-style blackjack
Blue Meanies from Outer Space: Shoot down aliens
Biorhythm/Compatibility: Compare biorhythms
Spacemath: Math improvement, grades 1–6
Slither/Super Slither: Dexterity game

CREATE YOUR OWN GAMES

with these programming aids from Commodore

VIC 20 Super Expander cartridge

Everything we could pack into one cartridge—3K memory expansion, high resolution graphics plotting, color, paint and sound commands. Graphic, text, multicolor and music modes. 1024 x 1024 dot screen plotting. All commands may be typed as new BASIC commands or accessed by hitting one of the VIC's special function keys. Includes tutorial instruction book.

VICMON Machine Language Monitor cartridge

Helps machine code programmers write fast, efficient 6502 assembly language programs for quick game action. Includes one line assembler/disassembler.

Programmable Character Set/ Gamegraphics Editor on tape

Lets the VIC create up to 64 programmable characters and use them in BASIC programs. Takes only one-half kilobyte of program space. Works with tape, disk and printer.

VIC-20
The Friendly Computer
CARTRIDGE
VICMON
ACCUMULATOR
VIC-20
The Friendly Computer
CARTRIDGE
SUPER EXPANDER
commodore COMPUTER

commodore COMPUTER

Contact a Commodore retailer in your area for any of these exciting arcade style games.

http://www.oldgamesitalia.net/ http://www.oldgamesitalia.net/

Snow 'em with your VIC!

NEW

Simplify your printer set-up with

SMART ASCII. . . . $59.95

At last! A simple, convenient, low-cost printer interface. **It's ASCII:** connects the VIC or '64 to your favorite parallel printer (Epson, Microline, Smith-Corona TP-1, etc.). **It's SMART:** *translates* unprintable cursor commands and control characters for more readable LISTings.

Converts user port into parallel port with Centronics protocol, addressable as Device 4 or 5. **Three print modes:** CBM ASCII (all CAPS for LISTing); true ASCII (UPPER/lower case for text); and TRANSLATE (prints (CLR), (RED), (RVS), etc.). For **any size VIC** or the **'64**. Complete with printer cable and instructions.

UN-WORD PROCESSOR 2. . . $19.95

The improved UN-WORD retains the practicality and economy of the original. Easy-to-use text entry and screen editing. Use with **any size VIC** (5K to 32K). Supports VIC printers, RS-232 printers, and now **parallel printers***, too. Handy user Menu selects: single- or double-space, form feed, print width, number of copies. Supports printer control codes. With complete documentation.

*Parallel printers require an interface. See SMART ASCII.

BANNER/HEADLINER. $14.95

Make GIANT banners on your printer. Prints large characters across the page or sideways down the paper roll. . .how about a 10-ft. long "Welcome Home!". VIC or RS-232 printers.

VIC-20 is a trademark of Commodore Business Machines

VIC-PICs. .IMPROVED! . .$19.95

Now with **hi-rez draw routine** for your joystick *PLUS* hi-rez **dump to VIC printer.** Features 19 fascinating hi-rez *digitized* pictures. Capture *your* creativity, or ours, on paper. Amazing fun!

GRAFIX DESIGNER. $14.95

Design *your own* graphic characters! Recall, erase, edit, copy, rotate. . .save to tape or disk for use in your own programs. Simple to use. Includes examples and demo routines.

GRAFIX MENAGERIE. $14.95

Three-program set shows off VIC graphics potential for art, science, music, business. . .learn by seeing and doing. Contains BASIC **plotting routines** you may extract and use.

TERMINAL-40 . . . . $29.95

Join the world of telecommunications in style: **40-character lines** and **smooth scrolling** text for easy reading! All software — no expensive hardware to buy. **4K** (or larger) **Receive Buffer** with optional dump to VIC printer. Function key access to frequently-used modes. Fully programmable Baud, Duplex, Parity, Wordsize, Stopbit, and Linefeed; supports control characters. Requires VIC-20, 8K (or larger) memory expansion and suitable modem. With 24 p. manual and Bulletin Board directory.

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All programs on high quality digital cassette tape.

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Dealer inquiries invited.

Introducing SOFTWARE FOR THE NEW COMMODORE 64

'64 TERMINAL ($29.95). Same impressive features as TERMINAL-40: **smooth-scrolling,** 40-character lines, VIC printer dump, etc. **GIANT 24K Receive Buffer.** No memory expansion required; requires '64 and modem.

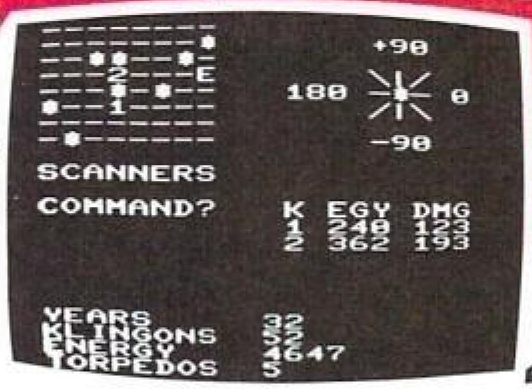
'64 GRAFIX SAMPLER ($19.95). Indulge in the graphics splendor of the '64. Interact with demos of techniques such as **plotting** of points, lines and 3-D objects; **drawing** in the hi-rez mode (joystick control); animating **sprites;** plus assorted graphics displays. Routines may be extracted for use in your own programs.

'64 PANORAMA ($19.95). Explore picture graphics on the amazing '64! Nineteen fascinating *digitized* pictures PLUS **hi-rez draw routine** for your joystick AND hi-rez **dump to VIC printer**. Capture our pics or *your* creativity on paper.

'64 BANNER/HEADLINER ($19.95). Make **GIANT banners and posters** with your '64 and printer. Supports VIC printers, RS-232 printers (requires interface), and parallel printers (requires Smart Ascii).

Victory Fun
Now Rea

Available now from stock. All these new programs fit in the standard VIC-20 memory and can be controlled from the keyboard. Where appropriate from a joystick as well. All programs on cassette tape.



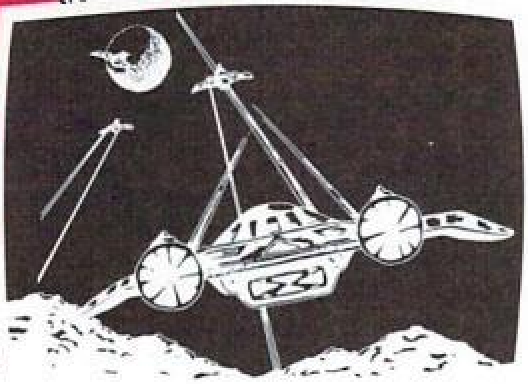
```
                +90

         180    -*-     0

                -90
SCANNERS

COMMAND?        K EGY DMG
                1 240 123
                2 362 193


YEARS           32
KLINGONS        52
ENERGY          4647
TORPEDOS        5
```

TREK* **$12.95**

The classic game that has fascinated computerists for over a decade. Commanding the bridge of your starship, you explore the galaxy, fending off the Klingon invasion with your phasers and photon torpedoes, at the same time conserving your limited time and energy. A real bargain at $12.95.

LUDWIG'S LEMON LASERS $14.95

You'd never think blasting lemons out of the sky could be so much fun! Fast machine code action. One or two players. Written by the demented doctor who gave us "Hospital Adventure".



ANNIHILATOR **$19.95**

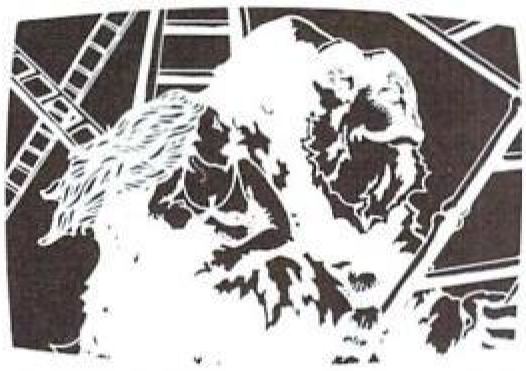
Defend your planet against the hostile aliens. All machine code makes this "Defender-like" program one of our best arcade games. Joystick required.

ADVENTURE PACK I*
(3 programs) **$14.95**

Big Bad Wolf—NOT for kids only! A fully packed adventure based on the Three Little Pigs fairy tale. Don't let the wolf gobble you up!

Computer Adventure—Re-live the "excitement" of getting your computer. An adventure with a very different flavor.

Moon Base Alpha—You must find a way to destroy the meteor that is racing towards your base, or else all moon colonies will be demolished!



KONGO KONG **$19.95**

Climb ladders, avoid the barrels the crazy ape is rolling at you, and rescue the damsel. Fast machine code action.

ADVENTURES

I still can't believe we packed full featured adventures into the VIC's 3.6K memory! Adventures are interactive fantasy games in which you solve a mystery by exploring an unknown environment with the assistance of your computer. You tell the computer what to do with plain english commands like "OPEN THE DOOR", and the computer tells you what it sees! Average solving time for our adventures is six hours.

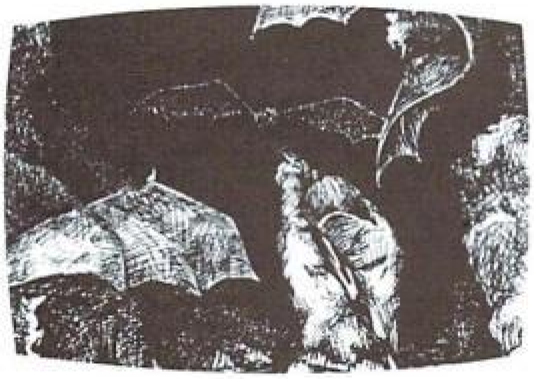
ADVENTURE PACK II*
(3 programs) **$14.95**

African Escape—As the sole survivor of a plane crash, you must find your way out of the dark continent.

Hospital Adventure—You are a spy whose mission is to complete the bungled assassination attempt on the evil dictator, who is recuperating in the hospital under heavy guard.

Bomb Threat—Get back to town to warn the authorities of the bomb planted by the terrorists who left you prisoner at their hideout.

-Tape Programs
dy for Holiday Giving!



TREASURES OF THE BAT CAVE **$14.95**

Battle the vampire bats as you search their cave for gold bullion. Fast, real time action will keep you playing for hours. Of course, you are in a different cave every time you play (the action takes place against the realistic 3-D display of the MAZE program).

MAZE **$12.95**

Don't buy this program if you suffer from claustrophobia! You try to find your way out of a maze on foot. The display gives an incredible 3-dimensional view. Machine code subroutines allow you to move as quickly as you can push buttons. You may view the maze from the top if you get hopelessly lost.

Plus, there are over $6X10^{23}$ different mazes that the program can generate. There is little chance that you'll see the same maze twice! There are nine levels of difficulty included.

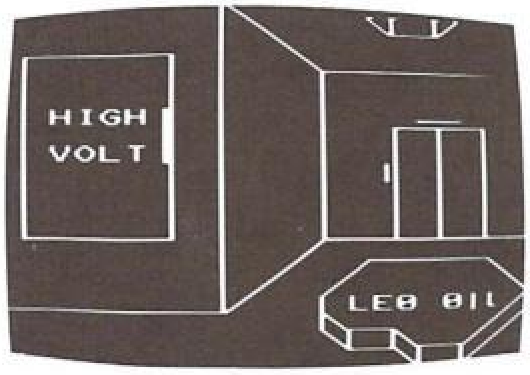
PROGRAMS AVAILABLE for the COMMODORE 64

VICTORY CASINO* **$9.95**

Enter the pleasure palace and try your luck at dice, numbers, and bluffing. Match your wits against 3 unique games of chance.

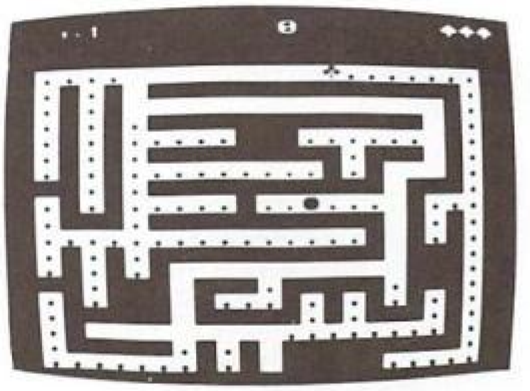
GET FOUR* **$14.95**

The classic vertical game of tic-tac-toe. Play against a friend or the computer as you try to get four in a row. The computer can play one of four different *strategies* (not just levels).



GRAVE ROBBERS* **$13.95**

Introducing the first GRAPHIC ADVENTURE ever available on the VIC-20! With realistic audio-visual effects, you explore an old deserted graveyard and actually see the perils that lie beyond.



STREET SWEEPERS **$14.95**

Gobble up all of the dots in the maze before the ensuing nemesis gets you. The maze is different every time, and if you succeed in getting all the dots, you get progressively harder mazes to complete as your skills increase. Does this sound like Pac Man? It isn't! Highly recommended and extremely addicting.

MANCALA* **$8.95**

Mancala survived over 3000 years from ancient Egypt so that you could play it on your computer! The computer plays masterfully on its hard level, competently on the easy level for learning purposes. If you enjoy chess or awari, you might just give them up for MANCALA. Easy to learn, difficult to master.

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OMEGA RACE

The Finer Points

by David Berezowski
Present Omega Race Champ

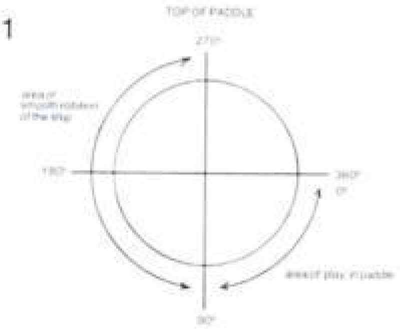
Tired of getting wiped out by the DROID FORCE? Want to hit 40,000 and get that much-deserved free ship? Or better yet, want to get six-digit scores? Here's how to do it! (Or at least how I did it!)

1. Get rid of that joystick! Grab firm hold of the game paddle, it's the OMEGA WARRIOR'S controller!

Here are some points to remember when using the paddle.

P1. The paddle doesn't rotate 360 degrees. It has what one might call a limited area of movement. It is this 'limited area of movement' that the young OMEGAN must learn to control and later master to become a WARRIOR!

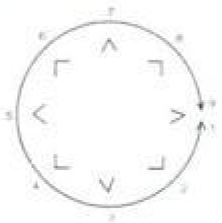
FIGURE 1



Referring to Figure 1, you can see that the paddle only rotates 270 degrees. Of this 270 degrees, approximately 180 degrees gives you a smooth rotation of your ship. The other 90 degrees is sort of like the play in a car's steering wheel. Don't be fooled by the play in the paddle.

P2. DEAD SPOTS:

FIGURE 2

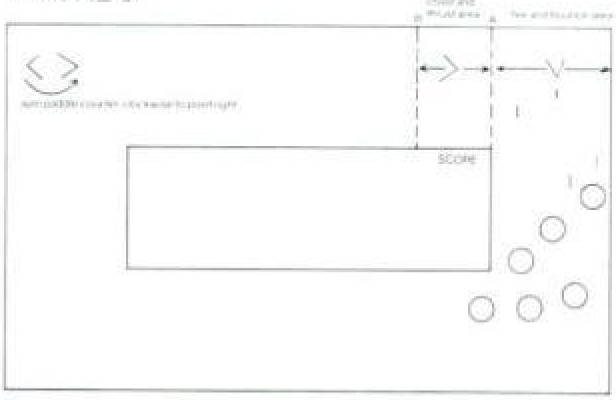


Referring to Figure 2, note that as you turn the paddle clockwise, your ship turns clockwise and vice-versa. HOWEVER, if you have turned your ship clockwise to position 9, and want to continue on to position 2, you can't! Note that the same is true if you're at 1 and want to go to 8. Therefore, when pointing left (<) remember what position you're at (either 1 or 9). If you're at 1 and want to go to 8, you'll have to quickly spin the paddle clockwise, and vice-versa if you're at 9 and want to go to 2.

2. When starting a new screen or round, always point your ship left (<). If the round begins with your ship on the right side of the screen then you are pointing in the right direction. (Proceed to step 3, The Technique). However, if you are on the left side of the screen, then quickly spin your paddle counter-clockwise so that you are pointing right (>). You are now ready for The Technique!

3. The TECHNIQUE: (This is what you've all been waiting for!). The whole secret to what I'm about to say lies in the fact that the DROIDS base their missile firing direction on where you are on the screen at the time they decide to fire at you. If you can get them to fire where they can't hit you, then you can blow them to bits. Here's how to do it!

FIGURE 3



T1. Referring to Figure 3.

a) Make sure you are pointing right (>). (You'll have to quickly spin the paddle counter-clockwise if you were following my instructions earlier!)

b) Thrust to a moderate speed and point your ship down (V), *after you have finished thrusting.*

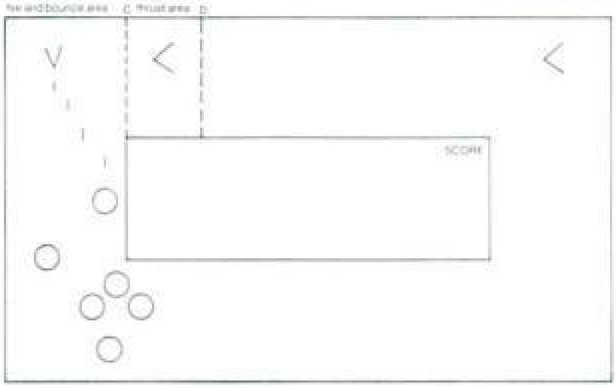
c) When you reach point A, rapidly fire down at the DROIDS. Continue to fire until you have bounced back to point A.

d) Point the ship right (>) (make sure you turn the paddle clockwise to get to this position). When you reach point B, thrust to a moderate speed and point the ship down (V) again (after you have finished thrusting of course).

e) Go to step C until all the DROIDS are dead.

f) Clean up as many 'mines' as you can and prepare for the next round by pointing your ship left (<).

FIGURE 4



T2. Referring to Figure 4.

Use the same technique as T1, except use points C and D instead of A and B, and point your ship left, instead of right. (You shouldn't have to turn your paddle if you were following my instructions earlier!)

Why does the above work??? If you time it right, by bouncing back and forth at a moderate speed, the DROIDS will fire at you while you are right of point A or left of point C. Fortunately they will fire up at an angle and their missiles will harmlessly hit the inner boundary. Thus there will be few (if none at all) missiles threatening you and you are free to fire down at the DROIDS. It's almost like shooting fish in a barrel!

NOTES

N1. Don't fire repeatedly into an explosion. They tend to act like black holes and 'eat' oncoming missiles. Better to space your missiles apart and wait until the explosion has disappeared.

N2. Don't fire more than four times in a row. The system tends to store up the fifth button press. After four missiles have been fired and the first missile 'dies', a fifth missile is mysteriously fired from your ship. THIS CAN REALLY THROW YOUR TIMING OFF! To see this in motion, try the following. Start the game and point your ship so that the missiles will fire along the top of the screen. Now quickly press the fire button five times. Four missiles will be fired and travel across the screen. As the first missile 'dies', a fifth missile will fire from your ship even though you haven't pressed the fire button!

N3. Pressing shifted F3 (i.e., F4) will give you five ships to start with instead of three. However, when reporting high scores, remember to note how many ships you started with!

N4. Using different color combinations might improve your game. I like a black background with cyan characters.

N5. Try and destroy the flashing DROIDS first. These guys soon turn into DEATH STARS which fly faster then you do and are very deadly. Never fire at a DEATH STAR head on. You must learn to anticipate where he is going and fire at where you think he will be, not where he actually is. This is due to the fact that the DEATH STAR flies so fast, that if you shoot right at him, by the time the missile gets there, he will be somewhere else.

N6. When in real danger, don't sit there like a dummy and shoot. Its much better to run away (firing as you go of course)!

Good Luck
David Berezowski

THE COMMODORE CHALLENGE
PRIZES PRIZES PRIZES

If you've been playing around at home developing original games and programs for your unexpanded VIC 20, send your best—on cassette or disk, please—to the Commodore Challenge contest. Include a brief description of the program's purpose, including documentation on how to use it. If it's a game, be sure to include instructions.

Programs requiring memory expansion are eligible, too, but will not be published unless space allows.

Each issue, we'll award prizes to two entries. First place winners will receive a VIC 20 8K Memory Expander Cartridge. Second place winners will receive a VIC 3K Memory Expander. All entries become the property of Commodore Business Machines, Inc., upon submission. Winning entries published by POWER/PLAY will become public domain software.

Fill out the entry form below, and submit it with your game or program to:

Commodore Business Machines, Inc.
The Meadows,
487 Devon Park Drive
Wayne, PA 19087
Attn: POWER/PLAY

COMMODORE CHALLENGE CONTEST · · · ENTRY FORM

Name ______________________ Age __________ Phone __________

Address ______________________ Program Title ______________________

City ______________________ State __________ Zip __________

I understand that my software entry becomes the property of Commodore Business Machines, Inc., upon submission, and that winning entries published by POWER/PLAY become public domain software.

Signature ____

Parent's signature, if contestant is minor ______________________________

VOID WHERE PROHIBITED

Behind the Programs

An Interview with Rick Madge, Creator of Garden Wars

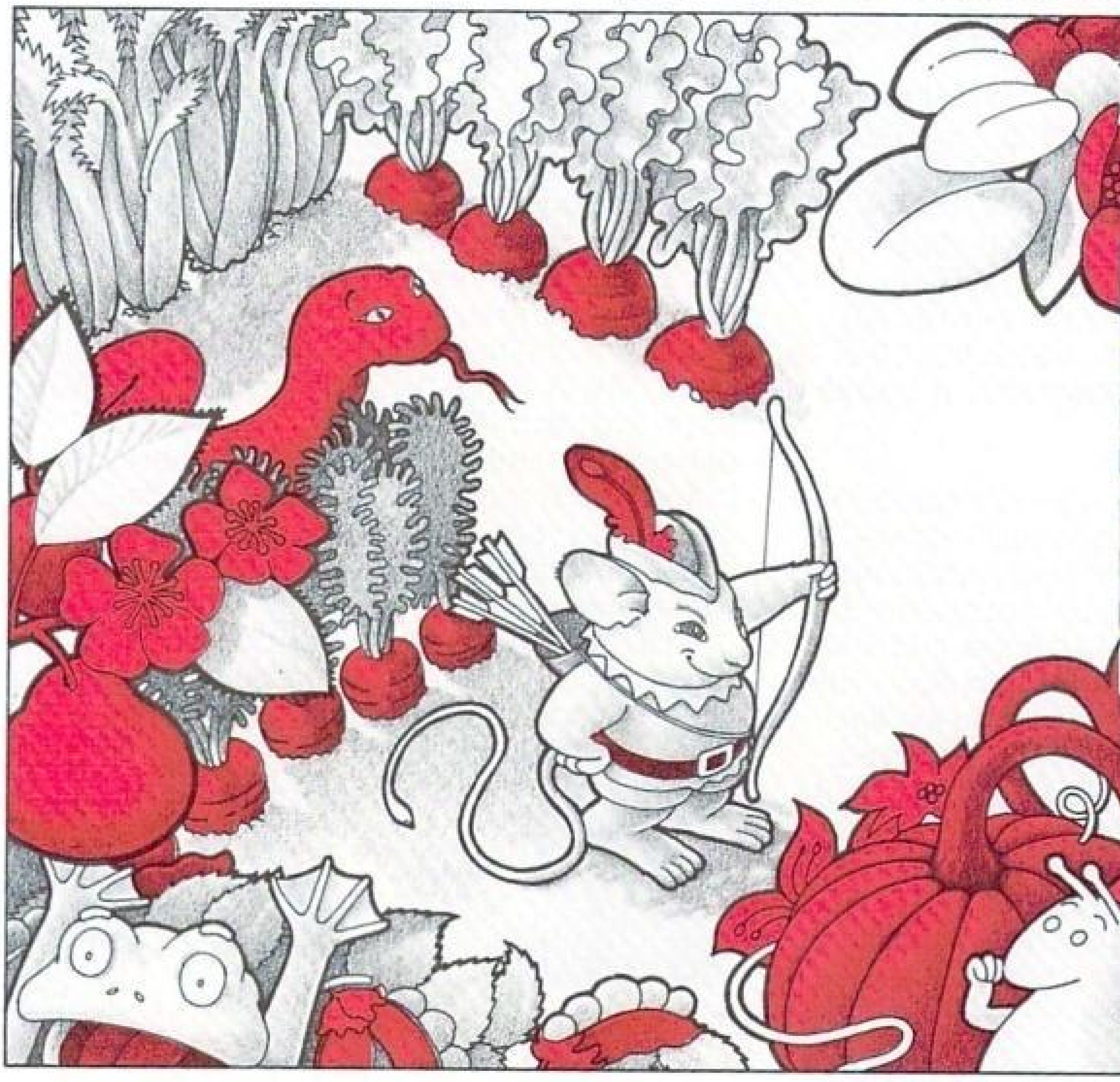


Illustration by Robert Hunchar.

Rick Madge

Rick Madge, the 25 year-old creator of Commodore's Garden Wars cartridge game, talks very softly on the phone (our method of communication for this interview), and seems to enjoy playing around on his computer more than he enjoys being interviewed. Nevertheless, he provides some interesting insights into how he came up with this unusual and challenging maze game, and (for those of you who aspire to seeing your name in our High Score column) some tips on how to score better.

Power/Play: For starters, who are you and what do you do in your real life?

Rick Madge: I'm a research engineer—an electrical engineer—for Ontario Hydro. My job right now is to investigate the effects of power lines on radio transmissions.

P/P: With that kind of background, how did you get into writing games?

RM: About three years ago, when I first started with Ontario Hydro, I was using one of their PETs as part of my job. I started playing around with it and decided I wanted one for myself. Before that my only experience with computers had been with the mainframes at university, which are *not* user friendly. The PET was a welcome change.

My first game was a golf game, but it was pretty crude because I was just learning BASIC—I'd only had a brief exposure to FORTRAN at university. Since then I've written a whole mess of games, but they're mainly just for myself, for my own amusement.

I especially like designing adventure-style games, where you program a little maze and wander around, getting attacked by monsters. I've also put together a program for playing the card game Euchre, but that's a 32K game for the PET.

P/P: In the game market the big thrust seems to be toward "space" or "cosmic" kinds of themes. How did you come up with the idea for something as down-to-earth as Garden Wars?

RM: I wrote a program called Rat Man, first. Garden Wars evolved out of that idea. It seemed to me to be something people could identify with, something familiar. And it's hard to come up with a new concept in a space game. Even if it's different, it would *look* like what's already out there.

P/P: How did you decide what elements would go in? For instance, the wiggling snakes impressed me.

RM: The snakes were easy. The truth is, things that seem most impressive are usually easy to do. But things that seem simple—like keeping the program running—are a lot harder.

When I was deciding what would go in, as usual there had to be chasers and chasees. Then, one way of fighting the chasers is to have arrows, so I gave the chasee arrows. But I wanted to have something that wasn't just killing, so I put in paralyzing, instead.

When the bombs explode, they send paralyzing shock waves in all four cardinal directions. Also, when the spiders turn blue, you can't kill them anymore. You can only stun them. And once they turn black, you can't get rid of them at all. Then you just have to run away from them.

I went through a number of things people typically associate with gardens to decide what to put in. I would have liked to put in flying insects that wouldn't be restricted to the boundaries of the maze, but it would have taken too much memory. As it was, I ended up with only about 8 bytes left once it was finished.

P/P: What do you consider the outstanding features of the game?

RM: First, you have all the various creatures that leave behind bombs and eggs. Then the spiders come from the eggs. If you don't kill them, they turn blue or black, and there are more and more of them. Another feature is the eight levels of play, with eight different mazes. I also like the treasures. There are eight of them, also. They're those flashing things you see appearing and disappearing.

P/P: What are the clues to scoring well in all that craziness?

RM: The best attack is to kill creatures and eat eggs. Also, don't shoot treasures, because when you do that they disappear and come up somewhere else. But if you run over a treasure, you get 100 points per treasure per level, and if you get all eight on one level you get 1000 points added at the end of that level. I tried to make it so a person couldn't just spend their whole time shooting. The clue to really racking up points is to get the treasures.

P/P: What do you see as the weaknesses of the game—the things you would have liked to improve?

RM: I would have liked to have had the flying insects come across the screen, but, as I said, that would have taken another 300 bytes that just wasn't there.

P/P: Did you run into any other obstacles as you were working on the game?

RM: None in particular. The main problems were in debugging, because it was my first attempt at programming in assembly language and I was always making dumb mistakes—typos mainly. Occasionally it would take me a week or so to find the mistake, so that held things up sometimes.

P/P: Among the computer games you've played, which one is your favorite?

RM: I usually don't play computer games. I've been too busy programming, and I like to program more than play.

P/P: For all our hot games people, what's your high score on Garden Wars?

RM: So far I've scored 81,000.

Editor's Note: *We've excluded game creators from our High Score competition.*

High Scores

VIC AVENGER
9,060
Bram Koster, Otterville, Ontario
JUPITER LANDER
207,400
Christopher Champlain,
St. Petersburg, FL
SUPER ALIEN
45,700
Robert Schaeffer, Brookline, MA
MIDNIGHT DRIVE
14.11 km
Nathan Mehl, Newark, DE
RADAR RAT RACE
122,240
John Higginson, South Holland, IL
SUPER SLOT
7,306 coins
Jerry Krueger, Cary, IL
PINBALL
1,500,000
Joe Ferrari, Commodore,
Toronto
MOLE ATTACK
309
Barbara Brey, Phoenix, AZ
DRAW POKER
12,819
Angie Traina, Jonesboro, LA
CAR CHASE
75,865
Zach Coleman, Charlotte, NC
SLITHER
325
Kelly Stanley, Florissant, MO
SUPER SLITHER
129
Robert Schaeffer, Brookline, MA
BLUE MEANIES
800
Jon Alderman, Willowdale,
Ontario
GORF
55,000
Joe Ferrari, Commodore,
Toronto
OMEGA RACE
3 ships: 194,050
5 ships: 204,980
David Berezowski,
Commodore, Toronto
GARDEN WARS
68,430
Joe Ferrari, Commodore,
Toronto

We had several high scores come in too late to make this issue. We'll get them into the March issue. If your score didn't set a record this time, keep playing! Maybe you'll topple these champion gamesters next time!

Winner of the J
Challenge Contest

VIC Baseball

by Mark Biggs

Ah, baseball! Remember the sweet spring air, the roar of the crowd? VIC Baseball is a great reminder of the season to come. A few clues: if you pick Team #1 you're the home team, which means the crowd cheers when you get a hit. That means, however, that Team #2 has to put up with cheers when they goof, because the home crowd is very rude toward visitors. The game offers you a choice of pitches and is pretty realistic in responding to your batting abilities. Use the keyboard to pitch and hit: F throws a fast ball, C a change-up, E a curve to the left and R a curve to the right. The letter P swings the bat.

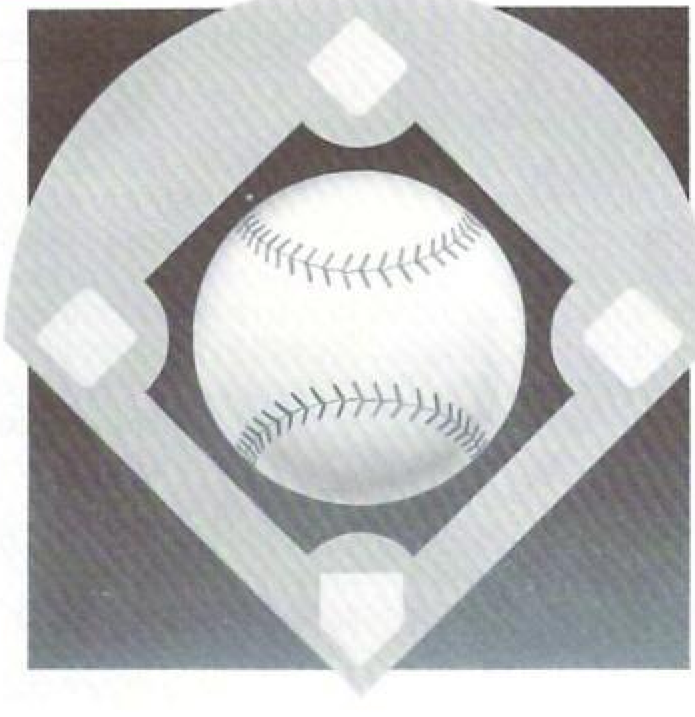


Illustration by Larry Motkowski

```
5 T1=1:VV=1:INPUT"NAME OF TEAM 1";C$
7 INPUT"NAME OF TEAM 2";D$
9 INPUT"#OF INNINGS";TN
10 PRINT"■";:POKE36879,205:POKE36878,15
15 FORX=0TO504:PRINT"■ ";:NEXT:PRINT"■■";
20 W=8151:D=1:Y=0:GOSUB25:GOTO35
25 POKEW+22*Y,32:POKEW+30720+22*Y,1:POKEW+
(2*D)+22*Y,32
27 POKEW+D+30720+22*Y,1:IFD=1THENPOKEW+D+22*Y,
78:GOTO31
29 POKEW+D+22*Y,77
31 W=W+D:Y=Y-1:IFY=-9THENY=0:RETURN
33 GOTO25
35 W=7985:D=-1:GOSUB25:W=7967:D=1:GOSUB25:
W=8153:D=-1:GOSUB25
40 IFVV=TN+1ANDVS=HCTHENPRINT"■■■■■■■■EXTRA
INNINGS!!■":FORT=1TO2000:NEXT:TN=TN+1:GOTO10
42 IFVV=TN+1THENPRINT"■■■■■■■■■GAME OVER!■":
IFHC>VSTHENGOSUB420:END
45 POKE7984,90:POKE7968,90:POKE7800,90:FORY=-
1TO9:POKE7976+22*Y,32:POKE38696+22*Y,1:NEXT
46 POKE8085,95:POKE8087,105
47 POKE7976,90:POKE8152,90:POKE8151,81:
POKE8173,66:POKE8175,32
49 POKE38704,1:POKE38520,1:POKE38688,1
50 IFT2=1THENZZ=6:GOTO55
52 ZZ=2
55 POKE38871,ZZ:POKE38893,ZZ:POKE38872,ZZ:
IFFB=1THENPOKE38704,ZZ
57 IFSB=1THENPOKE38520,ZZ
59 IFTB=1THENPOKE38688,ZZ
60 PRINT"OUTS="O,"INNING#"VV,"STR.="SR,"BLS.="BB,
62 IFT2=1THENPRINT"■"C$"="HC,"■■"D$"="VS"■■":
GOTO65
64 PRINT"■■"C$"="HC,"■■"D$"="VS"■
65 GETA$:IFA$=""THEN65
67 FORT=1TOINT(RND(1)*1000)+10:NEXT:X=0:Y=1
70 IFA$="F"THENQQ=1:Q=1:GOTO80
71 IFA$="C"THENQQ=1:Q=35:GOTO80
73 IFA$="R"THENX=1:QQ=5:Q=10:GOTO80
74 IFA$="E"THENX=-1:QQ=5:Q=1:GOTO80
75 GOTO65
80 POKE7976+22*Y,46:FORT=1TOQQ:NEXT:POKE7976+
22*Y,32:Y=Y+1:IFY=5THEN85
82 GETB$:IFB$<>"P"THEN80
84 SR=SR+1:GOTO400
85 POKE7976+22*Y+X,46:FORT=1TOQ:NEXT:
POKE7976+22*Y+X,32:Y=Y+1
87 IFY=10THENT=RND(1):IFT<=.6THENSR=SR+1:
GOTO400
89 IFY=10THENBB=BB+1:GOTO400
90 GETB$:IFB$<>"P"THEN85
91 POKE8085,95:POKE8087,105
95 POKE8173,32:POKE36876,230:FORT=1TO400:
NEXT:POKE36876,0:X=0:B=0:Z=RND(1)
98 IFY=7THENDX=-1:POKE8152,78:GOSUB105:GOTO140
100 IFY=9THENDX=1:POKE8152,77:GOSUB105:GOTO140
101 IFZ<=.15THENSR=SR+1:GOTO300
102 IFY=8THENDX=0:POKE8152,67:GOSUB105:GOTO160
103 SR=SR+1:GOTO300
105 FF=154
106 POKE8130+X+22*B,46:POKE36875,FF:FORT=1TO10:
NEXT:POKE36875,0:FORT=1TO10:NEXT:FF=FF+7
109 POKE8130+X+22*B,32:B=B-1:X=X+DX
110 IFB=-9THENRETURN
115 GOTO106
140 IFZ<=.75THENO=O+1:SR=0:BB=0:GOTO405
143 IFZ<=.85THENSR=SR+1:PRINT"■■■■■■■■■■■■";:
IFSR=3THENSR=2
145 IFZ<.85THENPRINT"FOULBALL■■■■■■■■■";:
FORT=1TO2000:NEXT:PRINT"■              ■■";:GIOTO300
146 IFT1=1THENPOKE36877,240
147 HM=1:SR=0:BB=0:IFZ<=.95THENW=1:GOTO410
149 W=2:GOTO410
160 SR=0:BB=0:IFZ<=.55THENO=O+1:GOTO405
161 IFT1=1THENPOKE36877,240
163 HM=1:IFZ<=.75THENW=1:GOTO410
165 IFZ<=.87THENW=2:GOTO410
167 IFZ<=.95THENW=3:GOTO410
169 W=4:FORL=130TO254:POKE36876,L:FORM=1TO40:
NEXTM:NEXTL:POKE36876,0:200 FF=195
201 FORC=1TOW:X=1:Y=-1
202 CH=1:CF=1:CS=1:CT=1
205 A=1:F=77:IFFB=1THENF=81:CF=ZZ
206 S=78:IFSB=1THENS=81:CS=ZZ
207 TH=77:IFTB=1THENTH=81:CT=ZZ
208 H=78:IFHM=1THENH=81:CH=ZZ
210 POKE8152+X+22*Y,H:POKE7984+Y+22*Y,F:
POKE7800+Y+22*X,S:POKE7968+X+22*X,TH
211 POKE38872+X+22*Y,CH:POKE38704+Y+22*Y,CF:
POKE38520+Y+22*X,CS:POKE38688+X+22*X,CT
212 FORT=1TO5:NEXTT:FORT=1TO10:POKE36875,FF:
NEXTT:POKE36875,0:FF=FF+1
214 IFA=1THENF=77:S=78:TH=77:H=78:CH=1:CF=1:
CS=1:CT=1:A=0:GOTO210
216 X=X+1:Y=Y-1:IFX=8THEN220
218 GOTO205
220 IFTB<>1THEN223
221 POKE36876,250:FORT=1TO500:NEXTT:POKE36876,0
222 IFTB=1ANDT1=1THENGOSUB420
223 SC=SC+TB:TB=SB:SB=FB:FB=HM:HM=0:NEXTC
300 IFO=3ANDT1=1THENT1=0:T2=1:O=0:FB=0:SB=0:
TB=0:PRINT"■";:GOTO40
305 IFO=3ANDT2=1THENT2=0:T1=1:O=0:FB=0:SB=0:
TB=0:PRINT"■";:VV=VV+1:GOTO40
310 IFT1=1THENHC=HC+SC:SC=0
315 IFT2=1THENVS=VS+SC:SC=0
320 IFSR=3THENO=O+1:SR=0:BB=0:GOTO405
325 IFBB=4THENHM=1:W=1:BB=0:SR=0:GOTO410
327 PRINT"■";:GOTO40
400 POKE36876,230:FORT=1TO100:NEXT:
POKE36876,0:GOTO300
405 POKE36874,180:FORT=1TO1000:NEXT:POKE36874,0
406 IFT2=1THENGOSUB420
407 GOTO300
410 FORT=1TOW:POKE36876,205
412 FORX=1TO700:NEXTX:POKE36876,0:FORX=1TO400:
NEXTX:NEXTT
413 IFT2=1THEN415
414 GOSUB420
415 POKE36877,0:POKE8151,32:POKE8152,90:GOTO200
420 POKE36877,240:FORX=1TO1000:NEXT:FORD=
15TO0STEP-1:POKE36878,D:FORT=1TO120:NEX
TT:NEXTD
422 POKE36877,0:POKE36878,15:RETURN

READY.
```

OK

Microphys Programs

PET

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(212) 646-0140

PET

VIC-20

VIC-20

Microphys, a leader in educational software development, is pleased to announce the release of several recreational software programs for use with the Commodore VIC-20 microcomputer. The VIC programs, described below, require a 3-K expansion cartridge and utilize the VIC's excellent color graphics and sound capabilities. Each program retails for $15 and is accompanied by complete instructions.

PROGRAM DESCRIPTIONS

PV901 - Missile Math: this program presents in a game format, an opportunity for youngsters (ages 5-15) to practice and develop the basic skills of addition, subtraction, multiplication, and division. Four levels of difficulty in each skill area may be selected. Problems in a given skill are randomly generated and missiles are launched at correct answers. The computer displays the results on each program run and may be directed to generate the same sequence of problems so that review and 'match play' (against an opponent) are possible.

PV350 - Cryptograms: this program permits the generation of 'secret' messages which are to be decoded. These cryptograms are displayed along with their unique code number classifications. To decode a cryptogram, the program is run from line 9000. Family members can challenge each other with their individually created messages. If you enjoy solving the cryptograms appearing in newspapers and crossword puzzle magazines, this program is perfect for you. Note: two VIC users may exchange encoded messages. User 1 creates a secret message and transmits this to user 2. The code number will permit user 2 to have **his** VIC decipher the message should he encounter any difficulty.

PV340-349 - Anagrams: this series of programs provides an educational challenge for virtually all age groups. The VIC randomly generates scrambled words which are to be identified. Two clues are provided in order to assist in this process. The clues in the school and college categories are generally definitive in nature. Many of the words used are part of the Microphys Spelling and Vocabulary series for the associated grade levels. Thus, reading, vocabulary, and spelling skills are reinforced by these Anagram programs. Note: the same sequence of words generated may be requested so that 'match play' is possible. There are 5 level-of-difficulty categories each consisting of two programs.

PV340-341	Recreational	PV342-343	College	PV344-345	High School
PV346-347	Junior High	PV348-349	Elementary		

PV375-380 - Wheel-of-Fortune Word Games: this series of programs represents an exciting challenge for every member of the family. Players try to fill in missing letters in a randomly generated title or phrase and earn and lose points according to the graphic display on a 'Wheel-of-Fortune'. The scores of as many as four players are displayed, 1000 points being required to win a given game.

PV375	Song Titles	PV376	Famous Places	PV377	Entertainers
PV378	Statesmen	PV379	Scientists	PV380	Sports Figures

PV601-644 - Missile Spelling: this series of 36 programs enables youngsters in grades 4 through 12 to practice and develop basic spelling skills. Each program contains 60 graded words. The VIC randomly selects groups of 5 words, one of which is spelled incorrectly. Missiles are launched in order to destroy the word misspelled. The words chosen for grades 7 - 12 correspond to the Microphys Vocabulary series. Note: there are 4 programs in each grade level.

PV601-604	Grade 12	PV606-609	Grade 11	PV611-614	Grade 10
PV616-619	Grade 9	PV621-624	Grade 8	PV626-629	Grade 7
PV631-634	Grade 6	PV636-639	Grade 5	PV641-644	Grade 4

PV401-460 - Vocabulary: each vocabulary program randomly generates graded words which are to be defined. A sentence, in which the word is properly used, is displayed when an incorrect response is made. Using this contextual clue, a second opportunity to define the word is given. Reading and spelling skills are also reinforced as a more powerful vocabulary is developed. There are 10 programs in each grade level.

PV401-405 and PV431-435	Grade 12	PV406-410 and PV436-440	Grade 11
PV411-415 and PV441-445	Grade 10	PV416-420 and PV446-450	Grade 9
PV421-425 and PV451-455	Grade 8	PV426-430 and PV456-460	Grade 7

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Making Friends with Sid

by Paul Higginbottom

The synthesizer chip in your Commodore 64 computer is affectionately known as Sid. Sid is in fact an acronym for Sound Interface Device. I doubt that many people realise just how powerful this chip is, but I intend to unleash some of its power for you. If you've read some of the documentation for the Commodore 64 about its sound capabilities and are new to (as I was) synthesizer jargon, you probably thought to yourself, "I'm never going to figure that out!" Well, I am the sort of person who gets more determined to figure something out when it seems harder than ever to do so. So, step by step, I, like any beginner, set about learning how to control the Sid's sound capability.

The Jargon

If your mind is like mine and tends to go blank when confronted with a barrage of alien jargon about something, then hopefully I can gently "break you in" with the terms associated with music synthesis using Sid.

The Sid chip is comprised of three sections essentially:

1) Oscillator section
2) Envelope section
3) Filter section

There are a few other bits and pieces, but more on those later.

Sid has three **voices**. That means to you and me, that up to three tones can be played at the same time.

Illustration by Robert Smith

Each voice is separately controlled by its **frequency** (the pitch of the tone), and more importantly, its **envelope.**

The envelope of a voice determines how its volume rises, sustains, and falls, like a musical instrument, or other sounds we hear in our lives. For example, a violinist will maybe play a note by pulling the bow across a string slowly at first (the volume starting out low). As the player starts to increase the speed and pressure of the bow on the string, so the volume increases, and as the player ends the note, he or she slows the rate and pressure of the bow again, and the volume fades away to silence.

With a single violinist, the tone may fade away rather abruptly, but I'm sure you've heard this rising and falling effect of volume with a piece of orchestration (many string instruments). That is one example of an envelope.

If we consider another example to allow you to grasp different types, think of hitting a cymbal. The rise to its maximum volume is almost instant, as the CRASH of the cymbal begins, and from that point, the sound simply fades away slowly to silence again. An example of a cymbal type of sound that does rise slowly first and then fade away would be a wave approaching the beach. You hear the slowly increasing volume of the wave moving up the beach, then as the wave trips over itself and hits the beach the loudest part of the noise is heard, and then the sound fades away as the wave slides up the beach and the next one approaches again.

Well, enough of the examples, back to the technical stuff. This "behaviour" of the volume (or **amplitude**) of a voice, can be defined in 4 parts, and this terminology is common amongst professional synthesizers costing many times the price of your Commodore 64 computer!

The four parts of an envelope

You may have noticed by now, that to define this changing in volume, we simply need to define the TIME it takes for a sound to go from one volume to another volume. For example, the violin might have taken half a second to go from no volume (silence) to its maximum volume, and then 2 seconds to fade away again (silence again). The cymbal took no time to reach its maximum volume (starts with the CRASH), but 10 seconds to fade away. The wave is different again, in that it might take 5 or so seconds to build up to maximum volume (as it moves up the beach), and then only 1 second to die away (as the wave falls over and crashes on the beach).

Part 1—ATTACK—This is the time taken to go from silence (0 volume) to the maximum volume Sid is set to.

Part 2—DECAY—This is the time taken to go from the maximum volume Sid is set to, to a given "mid-point" volume or sustained level of volume.

Part 3—SUSTAIN—This is not a time value, but is a level of volume the voice sustains at after the ATTACK and DECAY.

Part 4—RELEASE—This is the time taken to go from the sustained volume to silence once again.

In those definitions, I mentioned "the maximum volume Sid is set to", and that is the maximum overall volume (just like the overall volume control on your television or stereo).

How we control Sid

Before I go any further, I want to explain how we actually tell Sid exactly what weird and wonderful sounds we want it to make (so we can drive everyone crazy!).

The Sid chip has an amount of memory in it, and simply by putting numbers into those memories we give Sid all the information it needs to produce an infinite number of sounds. We put numbers into memories with the BASIC command POKE. We give the POKE command two numbers; the memory number (or 'address'), and the number we want to put into that memory (one memory location can hold any whole number between 0 and 255).

Sid's address is quite a big number. He starts at 54272, and he occupies that memory location and the next 28 also, up to 54300.

I want to show that it really is **not** that difficult to train Sid, and that you **don't** have to be a genius at programming.

Making your first beep

To make a noise, we must do 4 things:

1) Set the maximum overall volume
2) Set the envelope of the voice we wish to use
3) Set the frequency of the voice to the desired pitch
4) And only then 'tell' Sid to do it.

I put quotes around 'tell' in part 4, because I want to examine that closer. When we tell Sid to make a sound, we tell it to firstly do the ATTACK (rise up to maximum volume) and then the DECAY (go down) to a SUSTAINed level of volume. When we tell Sid to do that part, the noise will stay at the SUSTAINed level of volume forever if you don't tell it to go on and do the last part—the RELEASE (go down from the sustained level of volume, to nothing).

So to recap, we tell Sid to do the ATTACK-DECAY-SUSTAIN part first, and then when we're ready, we tell it to finish the envelope with the RELEASE part.

You could get a person to demonstrate this for you. Ask them to take a DEEP breath when you tap them on the shoulder and then hum a note, at first quietly, building up to a loud level, and the going down to a comfortable level. You have made a person do the Attack-Decay-Sustain part of an envelope.

I said the sound will continue indefinitely if you don't tell it to release, so when you tap the person again on the shoulder, they can slowly quiet their hum down to nothing. Of course if you decide to make them sustain for too long, they'll go blue in the face, and pass out! (Also, you may want them to stop before they get to the release, because their hum is so obnoxious!) (Fortunately, you can also do this with the Commodore 64!)

For now, let's just concentrate on ONE voice. Each voice has 7 memories inside Sid, to control it. Voice 1's memories are in fact, the first 7 memories, voice 2, the second 7, and voice 3, the next 7. That, if you've been doing your math, includes the first 21 memories in Sid. The other 8 (there are 29 in all) are for the filter section, which I haven't talked about yet, and other bits and pieces, including the overall volume control I have mentioned.

The 7 memories for each voice are all organized the same way. For example, the first two of each block of 7 control the frequency (pitch) of the voice.

The 7 memories for a voice

The first two, as I just mentioned, control the frequency of the voice; that is, the pitch of the sound.

The second two are to control one particular type of sound, which will be covered later.

The fifth memory is the controlling memory of the voice, the one that will tell Sid to start the note, stop it, and choose the type of sound.

The sixth memory controls the duration of the Attack and Decay.

The seventh memory controls the Sustain level, and the Release time.

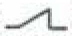
The fifth of the seven I just described, I will now explain further. I mentioned that apart from telling Sid to play the envelope, it also controls the **type** of sound. (Another piece of jargon coming up!) The type of sound is known as the **waveform**. You are probably aware that sound is comprised of air being compressed and stretched. By, for example, a speaker cone, which moves in and out. The speed (the FREQUENCY) at which it moves in and out determines the pitch.

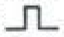
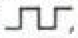
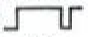
The way in which air is compressed and stretched is cyclic (repeats itself), and this cycle is known as the waveform.

Sid allows you to choose from one of four waveforms. It is the fifth of the seven memories in each voice that you set to tell Sid which waveform you wish to use.

The Waveforms

Triangular (shaped like this: _/_) This waveform, due its smoothness produces a mellow, soft flute-like sound (very pleasant to the ear!)

Sawtooth (shaped like this: ) This waveform, due to its abrupt ending produces a brighter, brass-like sound.

Variable width pulse (shaped like anything from this: , to this: , or this:  [which if you look is simply the first one upside-down]) This waveform as you can see from the description in parentheses can be varied, but is essentially an ON and OFF waveform, and as such is very abrupt and produces anything from a hollow, organ-like sound, to a very quiet, reedy sound. As you can see from the symbols of this waveform, it is comprised of pulse, or varying widths (hence the name). Memories 2 and 3, which I mentioned earlier were for a specific type of sound, do in fact control the width of the pulse when this waveform is chosen. Of course, memories 2 and 3 have no effect when any other waveform is selected.

Noise—I won't try to do a little drawing of this waveform, since it is in fact a RANDOM waveform, and has no defined harmonic qualities, but because the frequency can be altered, will produce any sound from a hiss (like you hear from poor quality cassette recorders), to a low rumble (good for special effects in games).

Please note the format of the memory locations used. I mentioned that the first TWO bytes are used to select the frequency, but did not say how one would know what values to put in one and the other. The easiest way to look at it, I would expect would be thus:

Since one memory location can only contain a number from 0 to 255, to represent larger numbers, they are stored as 0 to 255 in the first byte (known as the **low** byte), and multiples of 256 added to this in the second byte (known as the **high** byte), which means two bytes can hold a number from 0 (0 in both locations), to 65535 (255 in the first one, plus, 255 times 256 in the second one).

The ATTACK-DECAY memory, and the SUSTAIN-RELEASE memory are comprised as follows:

The ATTACK, DECAY, SUSTAIN, RELEASE parameters can all be one of 0 to 15. To form the ATTACK-DECAY value for memory location 6 in a voice's 7 memory locations, simply multiply the ATTACK by 16 and add the DECAY value. This again gives a combined value from 0 (0*16+0) to 255 (15*16+15).

The control register works differently still. The value is calculated as follows:

Add 1 to begin Attack-Decay-Sustain cycle; don't add 1 to begin the Release cycle.

Add 16 to select triangular wave form, 32 for sawtooth, 64 for variable width pulse, or 128 for noise waveform.

There are other parts to add to this value, but they won't be covered here.

The beep program

Turn on your Commodore 64, and type in the following program:

```
10 SID=54272
20 FOR I=0 TO 28:POKE SID+I,0:NEXT
30 POKE SID+24,15
40 POKE SID+1,20
50 POKE SID+5,0*16+0
60 POKE SID+6,15*16+9
70 POKE SID+4,1+16
80 POKE SID+4,16
```

Description of the program

Line 10 defines a variable SID, to the start of Sid's memory locations.

Line 20 should be included in all of your sound programs, and is a FOR . . . NEXT loop to simply set all of Sid's memory locations to 0 to ensure that no previous programs will affect our efforts.

Line 30 sets memory location 24 in Sid to 15. Register 24 controls the overall volume of Sid (and some other things which need not be known here), and 15 is the maximum volume (from 0 to 15).

Line 40 sets the upper byte of the frequency value of voice 1 to 20, which means a setting of 0+20*256=5120.

Line 50 sets the ATTACK value of voice 1 to 0, and the DECAY value also to 0, which means when we tell Sid to do its ATTACK-DECAY-SUSTAIN cycle, it will simply go straight to the SUSTAIN volume, since we've told it not to do any ATTACK or DECAY at all.

Line 60 sets the SUSTAIN value of voice 1 to 15 (maximum volume), and the RELEASE value also to 9, which means when we tell Sid to do its RELEASE cycle, it will take about three quarters of a second to fade away to nothing.

Line 70 sets the control register of voice 1 to do the Attack-Decay-Sustain sequence, with the triangular waveform selected (+16).

Line 80 sets the control register of voice 1 to do the Release part of the envelope, again with the triangular waveform selected (+16).

Having typed in this program, type:

```
RUN
```

And the familiar:

```
READY.
■
```

message will come back almost immediately, with the mellow sound fading away (provided you have the volume control on your television set up reasonably high so you can hear it!)

Well, there's a LOT of new things for you to absorb in this article before we can go on to further things. We've only done a PING so far, but we'll have Sid playing Bach soon enough (or maybe a little Genesis?). ■

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JOYSTICK *(continued from page 24)*

machine language routine. . .(SYS to it from BASIC then PEEK the memory locations used by the subroutine).

```
1000 ;*********************************************************
1010 ;* FOUR PADDLE READ ROUTINE (CAN ALSO BE USED FOR TWO)
1020 ;*********************************************************
1030 ;AUTHOR - BILL HINDORFF & JOE MCENERNEY
1040 PORTA=$DC00
1050 CIDDRA=$DC02
1060 SID=$D400
1070 *=$C100
1080 BUFFER *=*+1
1090 PDLX *=*+2
1100 PDLY *=*+2
1110 *=$C000
1120 PDLRD
1130     LDX #1        ;FOR FOUR PADDLES OR TWO ANALOG JOYSTICKS
1140 PDLRD0            ;ENTRY POINT FOR ONE PAIR (CONDITION X 1ST)
1150     SEI
1160     LDA CIDDRA    ;GET CURRENT VALUE OF DDR
1170     STA BUFFER    ;SAVE IT AWAY
1180     LDA #$C0
1190     STA CIDDRA    ;SET PORT A FOR INPUT
1200     LDA #$80
1210 PDLRD1
1220     STA PORTA     ;ADDRESS 1ST PAIR OF PADDLES
1230     LDY #$80      ;WAIT A WHILE
1240 PDLRD2
1250     NOP
1260     DEY
1270     BPL PDLRD2
1280     LDA SID+25    ;GET X VALUE
1290     STA PDLX,X
1300     LDA SID+26    ;GET Y VALUE
1310     STA PDLY,X
1320     LDA PORTA     ;TIME TO READ PADDLE FIRE BUTTONS
1330     ORA #$80      ;MAKE IT THE SAME AS OTHER PAIR
1340     STA PDLY+2    ;BIT 2 IS PDL X, BIT 3 IS PDL Y
1350     LDA #$40
1360     DEX           ;ALL PAIRS DONE?
1370     BPL PDLRD1    ;NO
1380     LDA BUFFER
1390     STA CIDDRA    ;RESTORE PREVIOUS VALUE OF DDR
1400     LDA PORTA+1   ;FOR 2ND PAIR -
1410     STA PDLY+3    ;BIT 2 IS PDL X, BIT 3 IS PDL Y
1420     CLI
1430     RTS
1440 .END
READY.
```

The paddles can be read by using the following BASIC program:

```
10 C=12*4096:REM SET PADDLE ROUTINE START
11 REM POKE IN THE PADDLE READING ROUTINE
15 FORI=0TO63:READA:POKEC+I,A:NEXT
20 SYSC:REM CALL THE PADDLE ROUTINE
30 P1=PEEK(C+257):REM SET PADDLE ONE VALUE
40 P2=PEEK(C+258):REM  "      "   TWO   "
50 P3=PEEK(C+259):REM  "      "  THREE  "
60 P4=PEEK(C+260):REM  "      "   FOUR  "
61 REM READ FIRE BUTTON STATUS
62 S1=PEEK(C+261):S2=PEEK(C+262)
70 PRINTP1,P2,P3,P4:REM PRINT PADDLE VALUES
72 REM PRINT FIRE BUTTON VALUES
75 PRINT:PRINT"fire a ";S1,"fire b ";S2
80 FORW=1TO50:NEXT:REM WAIT A WHILE
90 PRINT"S":PRINT:GOTO 20:REM CLEAR THE SCREEN AND DO AGAIN
95 REM DATA FOR MACHINE CODE ROUTINE
100 DATA162,1,120,173,2,220,141,0,193,169,192,141,2,220,169
110 DATA128,141,0,220,160,128,234,136,16,252,173,25,212,157
120 DATA1,193,173,26,212,157,3,193,173,0,220,9,128,141,5,193
130 DATA169,64,202,16,222,173,0,193,141,2,220,173,1,220,141
140 DATA6,193,88,96
READY.
```

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We'll do an experiment to get a glimpse of this inner superlanguage, called "machine language" or more accurately "6502 machine language".

If you have a VIC, remove any memory expansion.

Now: type the following lines:

```
10 REM XXXXXXXXXXXXXXXXXXXXXXXXX
20 SYS 1031
30 PRINT "THAT'S ALL"
```

Line 10 should contain 25 X's—count them to make sure they are right. Now: a special number for line 20: for all PETs, 1031 is the correct number as shown. For VICs, the line should read SYS 4103, and on the Commodore 64 the line should be SYS 2055. Type in the correct value, complete the program, and list it back to be sure it's right.

The number you have typed in line 20 isn't a mystery—it's the address of part of the program itself. In fact, it's the address of the first of the X's that you typed in. We're going to check that to make sure everything is right.

Type in the following direct statement, using the number from line 20:

```
A=1031 (or 4103, or 2055, as appropriate)
```

Now we'll check that everything is OK by typing:

```
PRINT PEEK (A); PEEK (A+23)
```

The computer should print two numbers, both of which are 88. What does this mean? That's how the letter X is held in the computer's memory . . .we're checking to see that we have the X's in the right place.

Putting in the program.

Now, here's the gimmick: we're going to fit a machine language program right inside a line of BASIC! We'll POKE it into place, byte by byte, and we'll use the value of A that was previously set. Type the following lines carefully:

```
POKE A,32        POKE A+9,16
POKE A+1,228     POKE A+10,32
POKE A+2,255     POKE A+11,210
POKE A+3,201     POKE A+12,255
POKE A+4,13      POKE A+13,202
POKE A+5,208     POKE A+14,208
POKE A+6,1       POKE A+15,250
POKE A+7,96      POKE A+16,240
POKE A+8,162     POKE A+17,238
```

Whew! That's it, but we'd better make one more check to be sure we have put it in OK. Type: T=0:For J=A TO A+17:T=T+PEEK(J):NEXT J:PRINT T and the machine should reply with value 2847, which shows that you didn't make any mistakes.

You may LIST your BASIC program again now. . .but there's an amazing change. Most of the X's have disappeared, and in their place is an astounding hodgepodge of stuff. Don't worry about it—that's where we have been POKE-ing about. It looks like a mess to us, but to BASIC it's just a REM—a remarks line of no particular interest.

Running it.

Type RUN, and the program will start. Nothing will seem to happen, but touch a key and—pow—the key is repeated sixteen times on the screen. Talk about speed typing!

You may terminate the program by pressing the RETURN key—the machine language program is looking for this key and will quit when it sees it. Before you stop things, you might note another interesting thing: machine language ignores the RUN/STOP key unless special arrangements are made to check it.

If by any chance the program does not work, there must be a mistake somewhere. Turn the computer off and back on again. No harm has been done; but you'll have to start all over.

How it works (Part 1).

We placed a machine language program inside a BASIC REM line. BASIC, of course, ignores everything inside a REM line, so it wasn't bothered. . .it proceeded to line 20.

Line 20 contained a SYS command. That's like a subroutine call: it's very much like GOSUB. GOSUB tells you to go to a BASIC subroutine, which will contain a RETURN statement when it's finished. SYS tells you to go to a machine language subroutine, which will give its own kind of return statement (called an RTS instruction).

So we go to the machine language subroutine—tucked inside the REM statement—do whatever it says, and eventually return to BASIC which finishes the job.

How it works (Part 2).

You don't need to know this kind of detail, but for serious students I'll give a detailed rundown on what the machine language program is up to. I'll show the POKE values; then I'll show the same numbers using a special numbering system called "hexadecimal" which machine language programmers use; and finally, a brief explanation of each instruction.

```
32 228 255   20 E4 FF   Get from keyboard.
201 13       C9 0D      If it's a RETURN key. . .
208 1        D0 01        . .skip next line;
96           60         Return to BASIC
162 16       A2 10      Set X count to 16
32 210 255   20 D2 FF   Print the character;
202          CA         Count down X
208 250      D0 FA      If more, back to PRINT
240 238      F0 EE      If not, back to start
```

It's not as legible as BASIC, but you can see that it has the same kind of clear logical structure that we use in BASIC.

If you can find the location where you placed the 16, you can try higher numbers there (maximum 255). Careful: variable A will have lost its value, so you must reset it or calculate the location yourself. To be sure, PEEK before you POKE.

Summary.

It's quite compact for some jobs: the whole Machine Language program fits inside a line of BASIC.

It's amazingly fast: BASIC couldn't print at that speed.

Perhaps most useful of all: Machine Language can give you a glimpse of the inner workings of your computer.

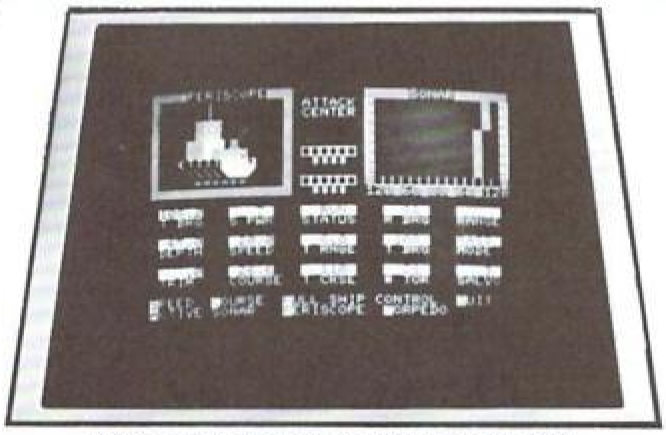
USER HINTS *(continued from page 6)*

(KEY 8) F8—CHR$(CTRL	F8—STEP (ret)
(KEY 9) F1—EDIT (ret)	F1—PROG (ret)
(KEY 10) F3—GOSUB	F3—RENUMBER
(KEY 11) F5—RETURN	F5—MERGE
(KEY 12) F7—STR$(	F7—OFF (ret)

I myself find that the program mode key assignments are not the most convenient. Since this depends on the program, though, the capability to re-define the keys helps a lot. For instance, for programs that use the printer, I would place PRINT#4, as KEY 3, and get rid of the little-used RUN command. After the program is entered, then I would naturally go into the EDIT key assignments to debug it.

Last, but not least, the cartridge gives a lot of freedom in listing a program and using the full screen editor. The following control sequences are implemented:

CTRL A—Scroll down a program listing
CTRL E—Cancels quote and insert modes
CTRL L—Erase character after cursor on same line.
CTRL N—Erase all characters after cursor
CTRL Q—Scroll up a program listing
CTRL U—Erase all characters on cursor line



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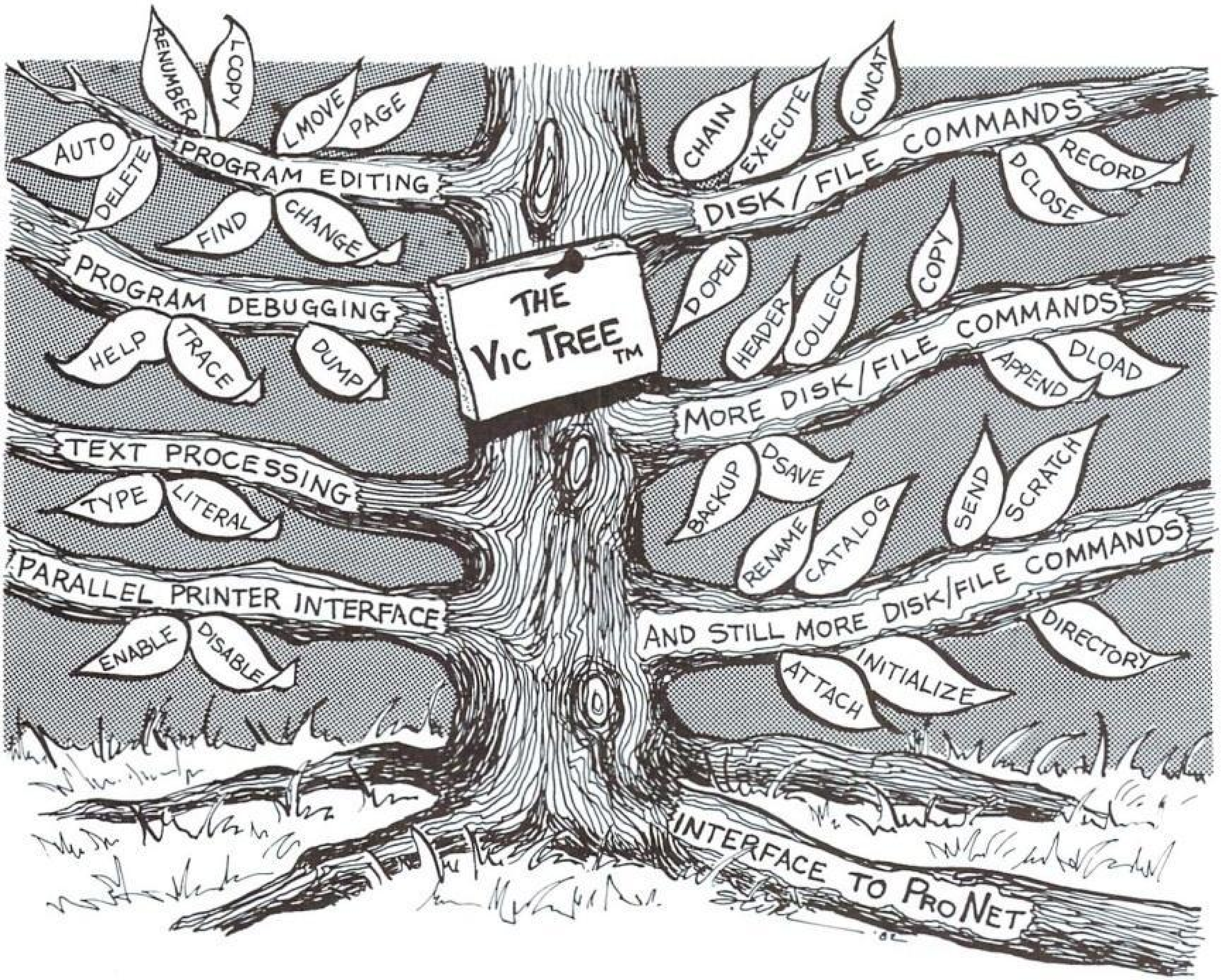
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PARALLEL PRINTER INTERFACE
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Tele/Scope

Do You Know Your M.Q. (Modem Quotient)? A Telecommunications I.Q. Test

by Jeff Hand

This short test will gauge how much of a general understanding you have of telecommunications. We originally planned to hire a staff of psychologists and educators to create the test, but they didn't want to work for peanuts. Therefore, I made up the questions a day after this magazine went to press (a tribute to my keen instinct for timing). This test is similar in nature to the popular psychological inventory tests seen in many popular magazines. The difference is the psych tests are meaningful. They probe and gauge such poignant personality traits as shyness, aggression, fear of flying, and the test we all fear: are you a jerk? This telecommunications test will not solve your marital problems, but I think it is a lot of fun to see how much you know. Don't feel bad if you don't do too well; the only reason I knew the answers is because I had the books in front of me.

1. What's baud rate?
   a) The number of bad jokes per minute in a night club act.
   b) Speed at which bits of information are sent over the phone lines per second.
   c) The speed at which Mae West walked across the screen.
   d) Electron flow across a pnp junction.

2. Describe full duplex.
   a) Both apartments are rented out for the rest of the year.
   b) A psychological condition in which the person is terrified of anything that comes in pairs.
   c) Simultaneous transmission and reception of data on the same phone line.

3. What are Bell 212 protocols for?
   a) When speaking to foreign diplomats it's the proper etiquette to use—money.
   b) Proper genuflecting for paying your phone bill.
   c) A code for marking up all services at least 212 percent.
   d) Transmitting information across phone lines at 1200 baud.

4. What does a computer network consist of?
   a) Processors (host)
   b) Network nodes (switches)
   c) Communication links (transmission lines)
   d) All of the above

5. How much time do you spend on CompuServe, accessing Commodore's Information Magazine?
   a) 0 minutes (better get on there quick if you want to pass this test)
   b) 1 hour
   c) 2 hours
   d) 3 hours or more

6. What does the word modem stand for?
   a) "Mo" is for modulate and "dem" is for demodulate.
   b) A new punk rock band.
   c) Diskette in Albanian
   d) Partial slogan for a lawn care business: "Modem weeds".

7. Describe Frequency Shift Keying (FSK).
   a) Number of times the car keys are lost in a year.
   b) Technique for sending morse code.
   c) Method of modulating a carrier frequency. A binary one shifts the frequency above the center carrier frequency. On the other hand, a zero shifts the frequency below the center carrier frequency.
   d) Interface device for the CBM user port.

8. Which of the following best describes the uses of a computer network?
   a) Electronic mail
   b) Database access
   c) Teleconferencing
   d) All of the above

9. What are the two major components of a network?
   a) Prime time shows and good actors.
   b) User subnetwork (host, terminal controllers, and terminals) and Communication subnetwork (networks nodes, communication links).
   c) Good underground connections and money.
   d) Howard Cosell and Dan Rather.

10) Name the three methods that links can communicate by.
   a) Simplex, Half Duplex, and Full Duplex.
   b) Phone, letter, and Western Union.
   c) Jimmy Dean, Bob Evans and Hickory Farms.
   d) Binding arbitration, impartial mediator, and a lawyer.

11) What are Bell Telephone's 103 protocols for?
   a) Transmission of information at a 300 baud rate or less.
   b) Rules for getting a new telephone installed.
   c) A regulatory action taken by Alexander Bell before going to bed.
   d) A new set of rules that developed from the 102 protocols.

12) Describe a network node.
   a) Similar to a nerd but not as severe.
   b) President of NBC.
   c) Messages are broken down into packets.
   d) Switching station for several communication links usually controlled by a microcomputer or a minicomputer depending on the complexity of the links.

13) What's an integrated network?
   a) The information is bussed across town to another node.
   b) Capable of communicating voice and data information, including point-to-point networks and broadcast networks.
   c) Algorithm for link switching.
   d) A totally actualized computer network that has reached the top of Maslow's pyramid.

14) What are protocols?
   a) Algorithm or rules for transfer of information.
   b) Rules for eating chicken and peas at a formal dinner party.
   c) Proper method for calling pigs at the state fair.
   d) All of the above.

15) What are stop bits?
   a) The last bits in your computer's memory.
   b) A signal to the computer to stop transmission.
   c) A blank bit(s) sent after each character to signal the end of that character.
   d) The metal bar put into a horse's mouth to make him stop.

16) Describe parity.
   a) Equal amount of time for each computer.
   b) Menu driven database.
   c) Anything that comes in pairs.
   d) Some computers check for transmission errors by setting the highest bit in each character in a certain way. In even parity, the total number of one bits in each character should always be an even number; in odd parity, the number of one bits is odd.

17) What's the name of the terminal software package for the VIC-20?
   a) VICTERM I
   b) Terminal Program I
   c) Mc Term
   d) All of the above.

18) What's ASCII?
   a) A New Englander talking about skiing.
   b) Sound of a person sneezing.
   c) American Standard Code for Information Interchange.
   d) All of the above (I'm running out of answers).

19) Describe Videotext.
   a) A new competitor in the home video market.
   b) A cover-all term used to include both broadcast teletext and telephone transmission systems. CompuServe is of the latter variety.
   c) The major reference work for the video industry.
   d) Conversion of numeric data into video images.

20) What's Telidon?
   a) A relative to the African elephant that has been extinct for a hundred thousand years.
   b) A new video game from Japan.
   c) Voice response technology.
   d) Standard for transmitting graphics over the phone lines to another computer, using alpha geometrics. The system is being utilized in the U.S. and Canada.

21) What are the different levels of Telidon?
   a) alpha mosaic
   b) alpha geometric
   c) alpha photographic
   d) All of the above.

22) What is asynchronous communications?
   a) A method of transmitting data in which the timing of characters on the transmission lines is not important. Characters are preceded by a start bit and a stop bit which allows intervals between characters to vary.
   b) A discussion with your mother-in-law.
   c) Sending characters across transmission lines where timing is critical.
   d) Satallite transmission to earth stations.

23) Lilly Tomlin plays a snooty telephone operator, that we have all met at one time or another. For the extremely advanced telecommunications nut, name that character.
   a) Maude
   b) Geraldine
   c) Ernestine
   d) Gertrude

Here is the answer key:

1—b
2—c
3—d
4—d
5—any
6—a
7—c
8—d
9—b
10—a
11—a
13—b
14—a
15—c
16—d
17—a
18—c
19—b
20—d
21—d
22—a
23—c

Give yourself one point for each correct answer.

If you scored between 0-10 take heart; we'll get you a telecommunications position with one of our competitors.

10-15 You're an up-and-coming telecommunications expert. You'll have to spend more time on CompuServe and Commodore's Information Network to bring your score up to par though.

15-20 Very Good. You're almost there; if you push a little harder you might make it all the way.

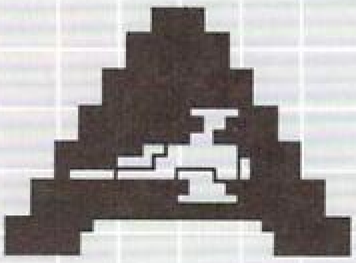
20-23 You're a fanatic and a Netwit (network wit)! Your monthly connect-time bill probably runs into hundreds of dollars. Your family probably hasn't seen you for several days, and when they do you're a disheveled wreck with a distant look in your bloodshot eyes, and a blank CRT expression on your face. Your fingers are itching to get back to the keyboard. You yearn for the great wideopen computer network with unlimited memory, more power and where seldom is heard a discouraging word. I recommend you seek help from Computerists Anonymous.

In the coming issues of Commodore's magazines this column will lower the nonsense-to-information ratio and cover technical topics on modems, computer networking and telecommunications. Stay tuned!

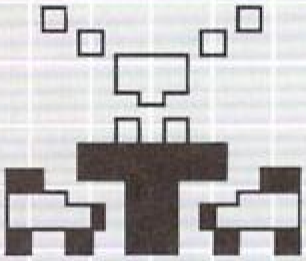
TODAY'S MENU

For Your VIC 20™

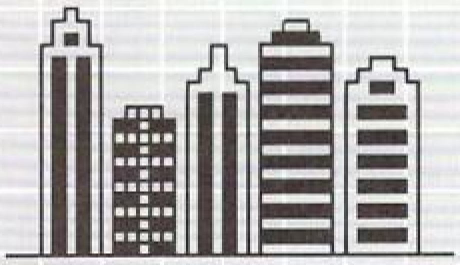
Games



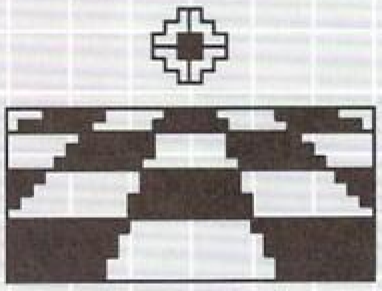
ASTROBLITZ
Protect your planet by destroying enemy saucers.



TRASHMAN
Drive the garbage truck and empty the city's trash cans. But watch out for the flies.

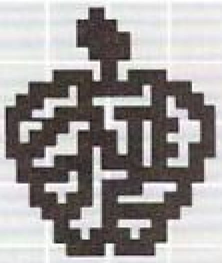


CITY BOMBER
Level a city to make it easy to land. Take off and do it again.

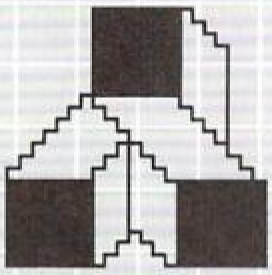


ACTION GAMES
SEAWOLF, BOUNCEOUT, or VIC TRAP. You'll need sharp eyes and quick hands for these.

Education



EDUCATIONAL/RECREATIONAL (I & II)
Put fun into learning math, spelling, and spatial relationships.



LOGIC GAMES
The computer is thinking. You should be, too.

Choose an Entree:

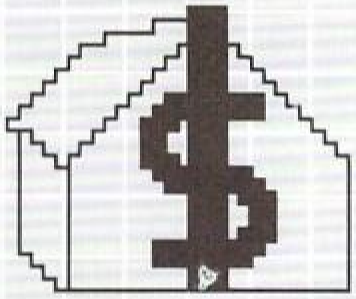
Maybe it's a colorful and challenging game like ASTROBLITZ, TRASHMAN, or CITY BOMBER; perhaps an educational game like HANGMAN or MATH HURDLER; maybe a basic diet of household concerns like HOME INVENTORY, HOUSEHOLD FINANCE, or DECISION MAKER.

Take your pick. All you have to supply is your VIC™ 20 and your own ideas about how to put our software to use. We supply the rest: competitive games, educational games, down-to-earth personal programs, and simple instructions that make everything easy to digest.

What you see here is part of the menu for today. We'll be adding more, so check our menu from time to time. It's growing, and it's all take home.

Contact your local outlet.

Personal



HOUSEHOLD FINANCE
Schedule the family budget, account for expenditures, and face the tax man with a smile.

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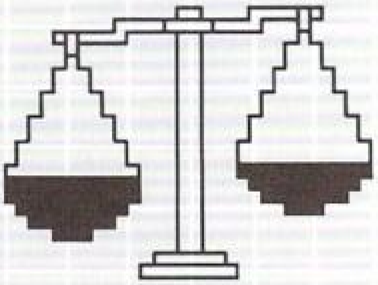
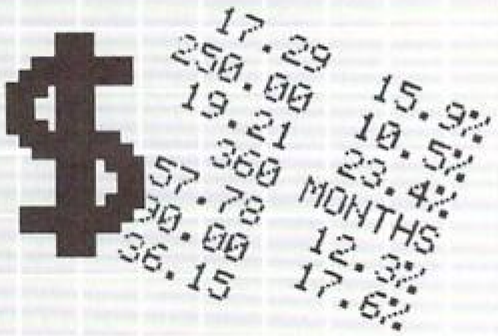
Make a record of what you own and revise it as you go. Find out what you've got in seconds.



DECISION MAKER
What should you do about virtually anything? Here's help.



LOAN ANALYZER
Home, car, boat . . . whatever: How much can you afford? Find out.

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New Products

Company: Cardco, Inc.
812 S. Lightner
Wichita, KS 67218

Product:

Cardboard/3 Economy Expansion Interface (Motherboard) for the VIC 20—The Cardboard/3 is an expansion interface that gives users access to more than one memory or utility cartridge. It will accept up to three RAM or ROM cartridges at one time. Uses T.R.W. gold-plated connectors. Circuit board is made of aircraft industry-standard fiberglass/epoxy compound. Board is fused to prevent accidental damage to your VIC 20.

Price: $29.95

Company: ECX Computer Company
2678 North Main Street
Walnut Creek, CA 94526

Product:

CX-6401 Serial Port Printer Interface—Allows the VIC 20 or Commodore 64 to use any type of standard parallel interface printer. The interface connects to the serial port/bus, not the user port, so the user port remains open for use by a modem or RS-232C peripheral device. Comes standard with a six-foot serial bus cable and connector for direct connection to the computer and a one-foot parallel cable for connection to the printer.

Price: $89.95

Product:

CX-6402 RS-232C Full Serial Interface—Allows the VIC 20 or Commodore 64 to use any type of RS-232C serial interface: printers, modems, etc. Connects to the user port. The CX-6402 is a complete RS-232C interface with all the features and levels required to interface all RS-232C devices. It allows full use of all eight active handshaking RS-232C signal lines on the computer. Comes ready to use with a six-foot parallel cable for connection to a printer. Does not require an external RS-232C cable.

Price: $59.95

Company: TOTL Software
P.O. Box 4742
Walnut Creek, CA 94596

Product:

TOTL Time Manager 2.0—For the VIC 20 with 8K expansion and printer; on cassette or disk. A set of two programs that allow you to create personal or business schedules, calendars of events and checklists of activities. Includes 56 different bar chart formats. You enter a description of each activity, the person responsible, project code, date, time and comments.

Price: $25.00

Product:

Research Assistant 2.0—For the VIC 20 with 8K expansion and printer; on cassette or disk. A set of programs that allow you to keep track of reference data and create keyword cross-reference lists. Keep data on reference sources: author, title, bibliography. Keep reference notes: page(s), text, up to 12 keywords, date(s). Create sorted keyword cross reference. Print data and/or cross-reference lists.

Price: $25.00

Product:

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BOOK REVIEW

Getting Acquainted With Your VIC 20: More Than 50 Programs

by Tim Hartnell, Creative Computing Press, 132 pages (paperback), $8.95

by John O'Brien

This book was originally reviewed back in the December, 1981, issue of *Commodore Magazine*. We are giving the revised edition a second chance for the benefit of *Power/Play* readers.

Neil Harris, the reviewer in *Commodore*, gave it a lukewarm rating. He felt that although the idea behind the book was good (to provide education in program techniques along with games and random number exercises), it had far too many problems. The main problems, according to that first review, were that the programs weren't that great, some didn't even work, and that the book seemed as if it were originally written for another computer because it has commands that don't even apply to the VIC such as "enter" and "newline".

Even in the revised edition, some problems still exist. For instance, on at least one occasion the author still uses the word "enter." Also, most of the programs are still not terribly exciting, and are more useful for their teaching value than their game-playing fun. The "Star Trek" game is a good example of this.

Despite these problems I give this book a higher rating than it was given previously, even at the risk of disagreeing with my boss. First of all, the programs have been fixed. I feel the book is fairly good if you keep in mind its limitations. For example, if you think of this book as a textbook to learn BASIC you will be disappointed. It is not "Everything that you always wanted to know about BASIC, but were afraid to ask." And if you are already writing fairly sophisticated programs this book will be too easy for you.

However, it is good if you've just barely outgrown the VIC users guide and hunger for more knowledge. There are, of course, other sources for this kind of information, but used as a supplement with other sources it will help pound VIC BASIC into your skull. If you are like me, then you need all the pounding you can get.

I also enjoyed the teaching method used by Hartnell. The book will give you a program to try out. When you try it out you usually find that the program is lacking something. Then it is explained how you can make the program better. The annotation will point out (if you haven't guessed already) what is missing and how to fix it. After awhile the author won't show you how to fix it, since you should be able to do it for yourself by that point. In direct contrast to Commodore's "An Introduction to BASIC" the author doesn't recommend using flow charts. Not being a serious programmer, I'm not sure which method is best. You'll have to figure that out for yourself.

As for the programs not being great, that may be true but I found some that are worthwhile, such as "Labyrinth." Plus, as you learn more BASIC, you can expand and change the core of these programs on your own to put in the things that will make them better.

This book is not for everyone. If you know too much or too little it is not for you. If you have a large software library it may also not be for you. But, for those certain people who don't fit in any of those categories, I give the book a guarded recommendation. Just make sure and keep the limitations in mind before you shell out $8.95.

Best Books

VIC BASIC: A User-Friendly Guide. Zamora, Inman, Albrecht & Dymax: Reston Publishing

VIC Games and Recreations: Adventures with the Rainbow Machine. Zamora, Kunkin & Dymax: Reston Publishing

Start with BASIC on the Commodore VIC 20. Monro & Tidy: Reston Publishing

Armchair BASIC. Annie & David Fox: Osborne/McGraw Hill

Fundamentals of Programming in BASIC. Robert C. Nickerson: Little, Brown and Company

Computer Programming for the Complete Idiot. Donald McCunn: Design Enterprises of San Francisco

The First Book of Microcomputers. Robert Moody: Hayden Book Company

The Computer Tutor. Gary W. Orwig & William S. Hodges: Winthrop Publishers, Inc.

PROGRAM REVIEW

Commodore's BASIC Programming –Part II

by Mike Heck

For those of you who completed Part I of this easy-to-follow introductory course on BASIC for the VIC 20 and are ready to expand your understanding of the language—or those who just want to learn more—this second offering won't disappoint you. If you feel ready for new, and perhaps more difficult, challenges—settle down for some long, but enjoyable sojourns with your VIC 20.

The course follows the same format and design established in Part I: a well thought-out and illustrated book broken down into 10 units plus several appendices. Accompanying the course are two cassette tapes with many examples for you to try and work with. The tapes also contain a number of useful "utility" programs that help tremendously in designing your own programs, such as sort routines.

As with Part I, author Andrew Colin places the emphasis on teaching by example and doing, rather than just reading. And the examples present everyday problems and solutions that can be put to use by just about anyone.

But to get the most out of the course, especially as the units get more complex, it's important to remember that time is the critical element. Study each unit in detail, complete the practical problems given, and be patient, as some of the later units may take four or five days to absorb. It is also important to understand one unit before proceeding to the next because the new unit will build on past concepts. If you are having trouble with a section, go back and read it again. In most cases the concepts will become clear through studying the straightforward examples and descriptions.

Part II begins with a description of DATA and READ statements and how they can simplify programming by allowing you to write generalized programs and just change the DATA lines for each new problem. A great example shows how to calculate the most efficient way to break down a sum of money into the least number of bills and coins, using British currency. The reader is left to figure out how to modify one program DATA line to handle U.S. currency. A simple example that gets its message home in an understandable and direct way.

A number of units deal with program logic, writing more efficient programs, and how the VIC 20 behaves in unexpected ways. For example, an effective way to limit a program size is to put multiple statements on a line, but there's a catch. You can't jump to a statement in the center of the line and IF. . .THEN logic might not act logically! If that doesn't make sense it will after you complete the logic unit.

Subroutines are another advanced area that demand special attention. Their correct use will increase the efficiency of a program many times. In this unit you gain confidence in writing subroutines and building larger programs from smaller modules.

Even more than the information presented, the most impressive thing that is woven throughout the course is the emphasis on good programming practices, something that is lacking in many commercial programs. Good documentation and error checking are stressed from the start. You'll never find an example that "crashes" or gives questionable results.

Arrays are another sometimes difficult concept presented in a useful and entertaining way, ending with the reader designing a program to access phone numbers stored with corresponding names in a two-dimensional array.

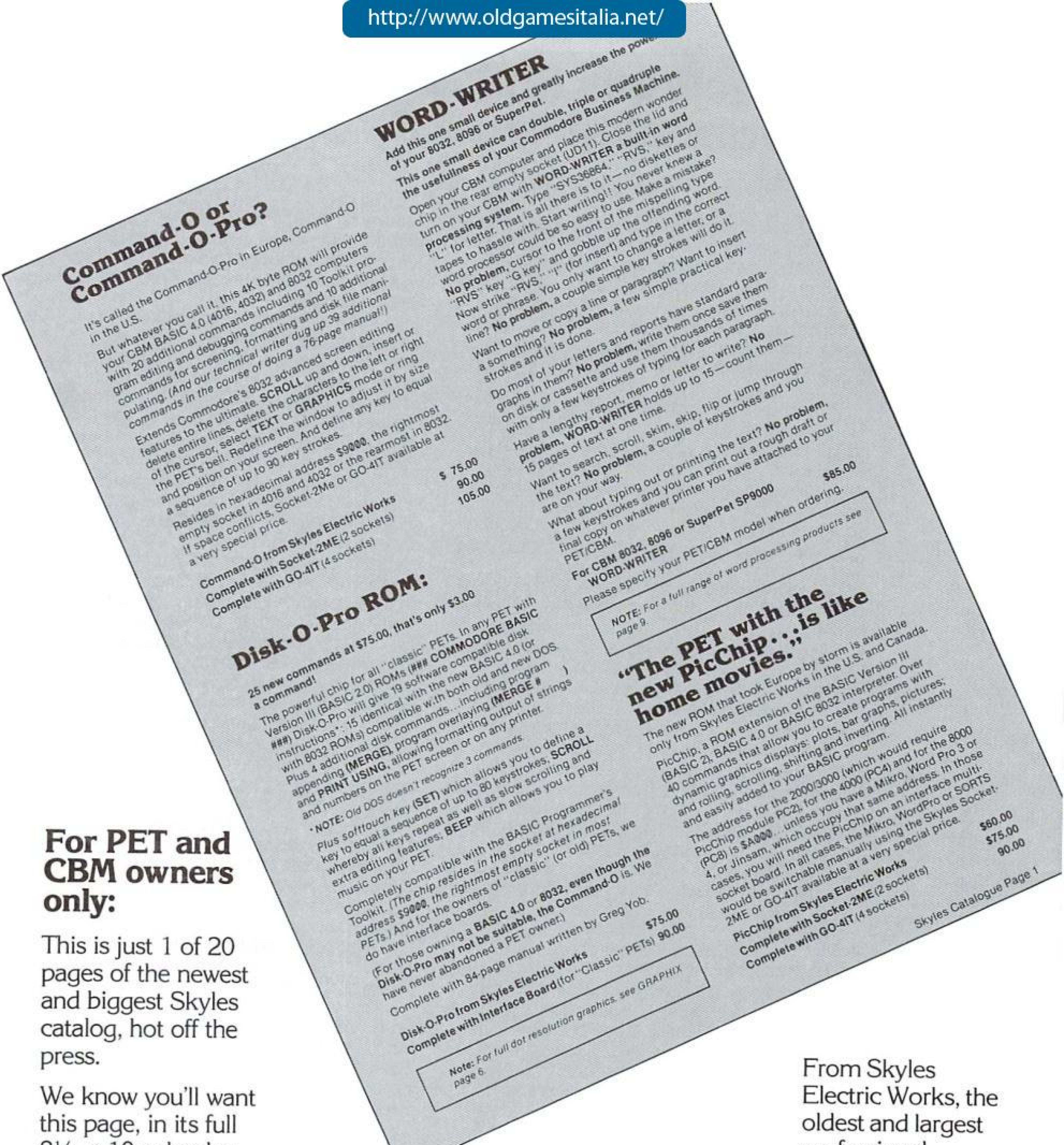
One of the more interesting areas covered involves sorting elements into either alphabetic or numeric order. The "bubble sort" and "quicksort" routines should be of interest to all, including experienced programmers. Other topics include just about everything you might want to know about the VIC and BASIC, from logical operators to memory maps and a music tutorial that rivals many dedicated music texts.

As a tribute to its completeness, certain information in the course is seldom available elsewhere, such as the ASCII codes for each key in any of four modes. And this is invaluable for serious programming. Ever need to know what a "Commodore Shift" 8 is (holding the Commodore key and 8 key)? Answer: 40.

After the study and work is over, the author presents a number of his original games that make extensive use of the programming techniques introduced throughout the course. Relax and have some fun.

The only minor irritation is that the text was reprinted unchanged from the original designed for U.K. distribution. As a result, some may find a few examples hard to follow, such as one explaining game scoring, using Cricket as the example.

But not taking anything from an excellent job, when you complete the course you will have been introduced to almost everything there is to know about BASIC and will be able to appreciate and put to use the immense power of the computer with your new skills.



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It's called the Command-O-Pro in Europe, Command-O in the U.S.

But whatever you call it, this 4K byte ROM will provide your CBM BASIC 4.0 (4016, 4032) and 8032 computers with 20 additional commands including 10 Toolkit program editing and debugging commands and 10 additional commands for screening, formatting and disk file manipulating. *(And our technical writer dug up 39 additional commands in the course of doing a 76-page manual!)*

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Resides in hexadecimal address **$9000**, the rightmost empty socket in 4016 and 4032 or the rearmost in 8032. If space conflicts, Socket-2Me or GO-4IT available at a very special price.

Command-O from Skyles Electric Works	$ 75.00
Complete with Socket-2ME (2 sockets)	90.00
Complete with GO-4IT (4 sockets)	105.00

Disk-O-Pro ROM:

25 new commands at $75.00, that's only $3.00 a command!

The powerful chip for all "classic" PETs. In any PET with Version III (BASIC 2.0) ROMs (**### COMMODORE BASIC ###**) Disk-O-Pro will give 19 software compatible disk instructions*: 15 identical with the new BASIC 4.0 (or with 8032 ROMs) compatible with both old and new DOS. Plus 4 additional disk commands...including program appending **(MERGE)**, program overlaying **(MERGE #**) and **PRINT USING**, allowing formatting output of strings and numbers on the PET screen or on any printer.

***NOTE:** Old DOS doesn't recognize 3 commands*

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Note: *For full dot resolution graphics, see GRAPHIX page 6.*

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For CBM 8032, 8096 or SuperPet SP9000 WORD-WRITER	$85.00

Please specify your PET/CBM model when ordering.

***NOTE:** For a full range of word processing products see page 9.*

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Skyles Catalogue Page 1

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by Ned Horn

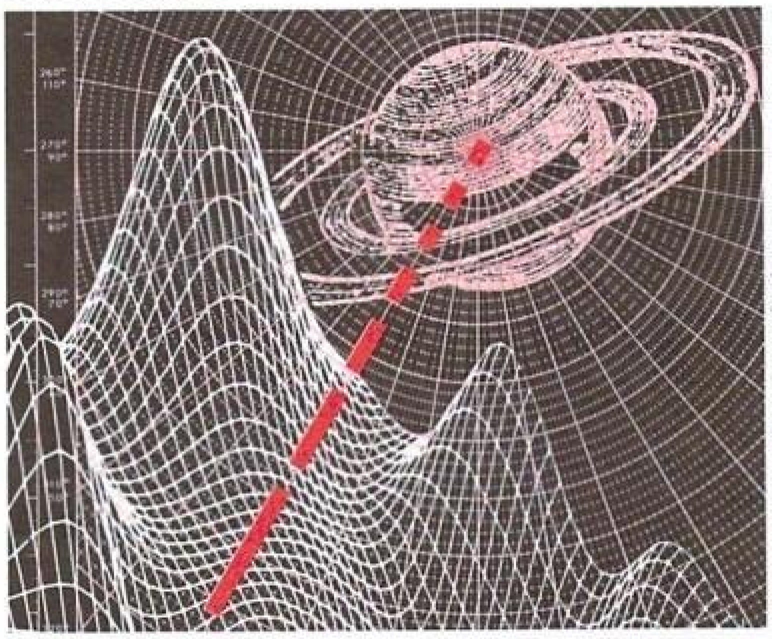

Illustration by Jeff Gernsheimer

CAPTAIN ZURGLE! SIR!

The captain raised one weathered tenacle from his framistan, giving his cabinboy a stare that would wither a Sirian Womp-Rat.

"Yes, Higly, what is it this time?"

"Well Sir . . . Your pet Brain-Parasite got loose. It . . . it seems to have eaten some of the computer's data banks."

"WHAT!"

"It also seems to have eaten the First Mate."

The Captain's underface, normally a calm bright red, turned a frightening shade of pink.

"WHICH DATA BANKS!"

"That's the real problem sir. It ate all the astronomical charts."

The cabinboy fully expected to see his captain molt in anger. To his surprise, Captain Zurgle sighed in relief.

"Well, Higly, that's not as bad as I had expected."

"But sir, without that data how can we complete our mission?"

"Why, with a little help from the natives, of course."

Captain Zurgle turned his attention to a strange native artifact.

"That," said the captain, "Is a VIC. And this is VISIBLE SOLAR SYSTEM."

The captain inserted an oblong object into the VIC and turned it on.

"Observe, Higly! Here you see the planet Earth," A rotating spheroid appeared on the screen. "Earth is the home planet of the creatures who built this machine. At the top of the screen you can see its relation to the other planets that are visible from Earth. At bottom are its important statistics."

"But . . . can we visit other planets?"

"Of course. Here's Mars." A different planet appeared. "Observe the craters. And here's Jupiter, and finally Saturn."

"Are the real planets this attractive?"

"That's a matter of taste."

"But without our computer how will we know what our escape velocities should be? We might land on a planet and never leave!"

"Relax. VISIBLE SOLAR SYSTEM can compute our escape velocity for us. It will also tell us about the temperatures of the planets, and will even calculate our adjusted weight under different gravities. For example, on Earth a heavy guy like myself would weigh about six pounds, so on Jupiter I would weigh 15."

"Captain! Then you would weigh as much as the Supreme High Muckamuck himself."

"Ah! But on Jupiter the Muckamuck would weigh forty pounds."

"Too bad. But tell me, Captain, how will we be able to calculate our flight path?"

"Simple, Higly," Captain Zurgle pushed a button on the VIC. Suddenly Higly was looking down at the orbits of all the planets. He could watch the planets move at their actual relative velocities around the sun."

"That's fine if we're entering from the top of the solar system, but we came in at an angle."

"No problem. Look. By adjusting our starship coordinates we can see the planets in their orbits exactly as they might look from our ship's window."

"That's incredible, Captain. Why, we can go home and file our report right now. Tell me, what else did you find on Earth before we blew it up?"

"Something called a 'Home Baby Sitter'."

"What's that?"

"I don't know. Why don't we read the review and find out . . ."

HOME BABYSITTER

Anyone setting out to design educational software for the home today is faced with a difficult choice. Should the programmer emphasize solid, albeit boring, educational drills, or should the program be FUN, in big letters, and educational as an afterthought? Too little emphasis on entertainment can result in a product that kids would use only under parental supervision. Too much might sacrifice any real scholastic value.

HOME BABYSITTER skirts this issue by providing three separate programs in one cartridge. A simple "sing along" alphabet program teaches pre-schoolers their ABC's. A "counting" program provides solid drills in counting numbers up to 20. Both of these programs are ideally suited to classroom and parentally supervised situations.

Of course, most kids have an attention span of about 12 seconds. A "Face Maker" game is

(continued on page 66)

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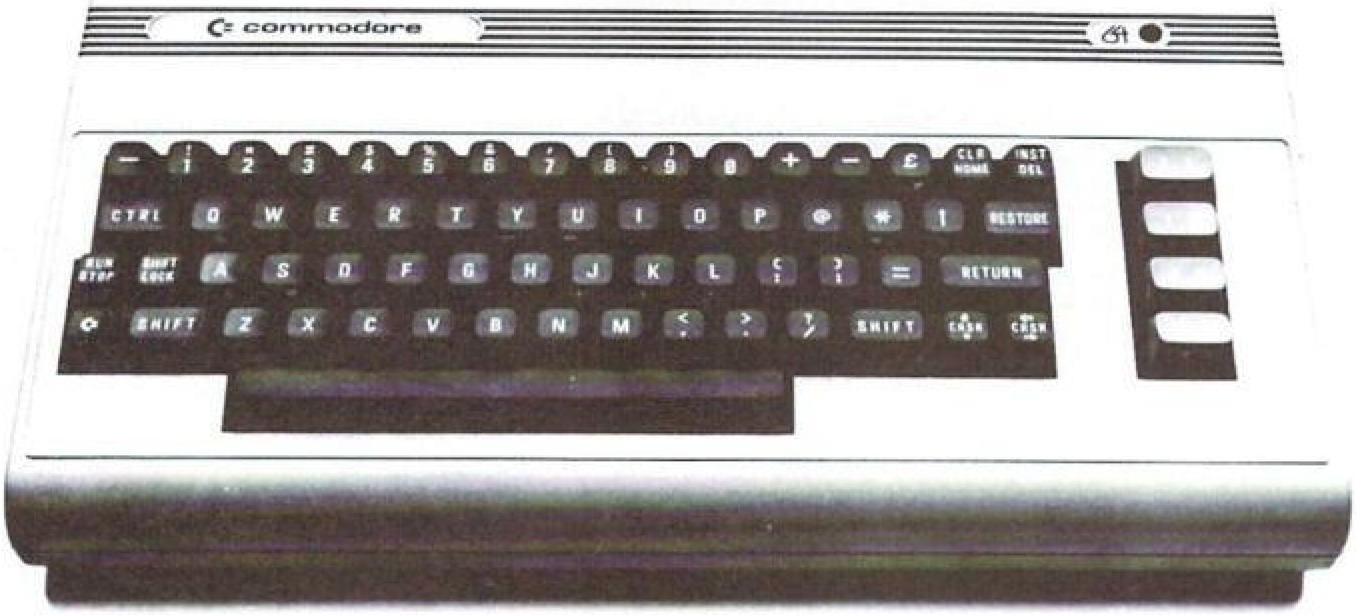

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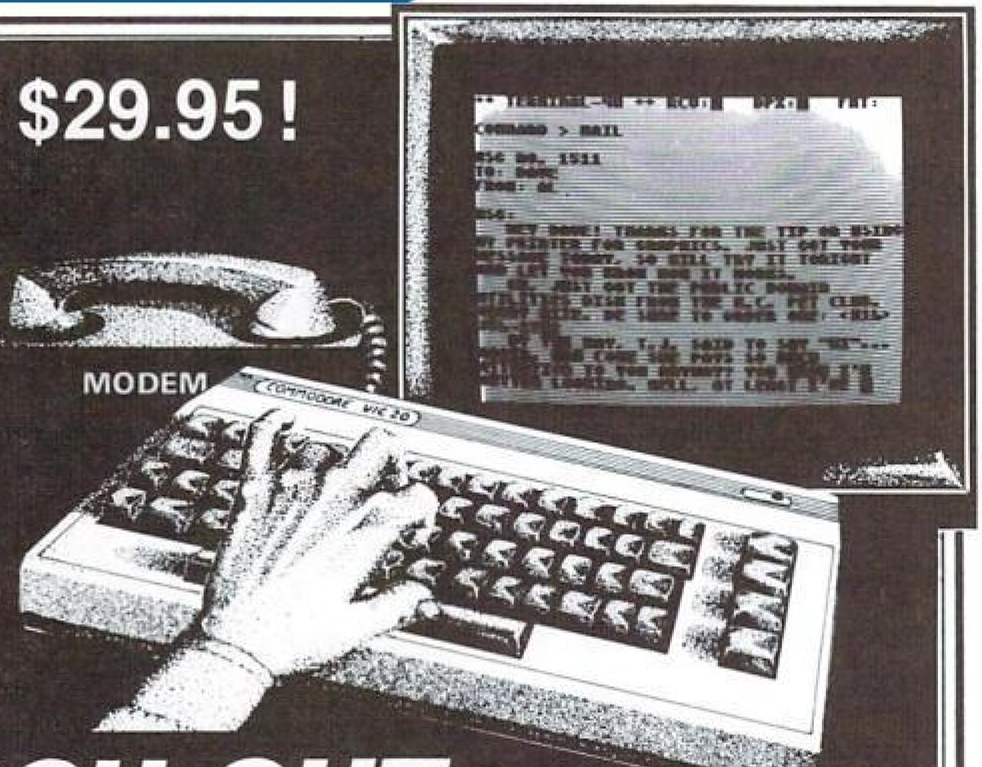

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Get Serious

What's happening on the POWERful side of Commodore products

In this issue we've touched on several of the fun-and-games capabilities of the Commodore 64. But, as we all know, underneath that fun-loving exterior beats the heart of a sophisticated computer with serious capabilities for business, educational, scientific and other highly technical applications. To meet the needs of all our 64 users—including those in education, business and science as well as those at home—Commodore is developing a variety of software packages we think you should know about.

These packages are now available from Commodore: **EasyFile**, a database that allows the user to define data, see how it looks on the screen, enter, retrieve and edit; **Word/Name Machine**, an entry-level word processor and name/address list combined in one package, ideal for letters and other short documents; **Mailmate**, a full-featured name and address program for small businesses, clubs or other organizations; **PET Emulator**, allows a high level of existing PET software to be used on the 64; **EasyLesson** and **EasyQuiz**, give educators the ability to create and administer lessons and tests with ease.

Commodore also has these packages available: **EasyCalc**, an electronic spreadsheet with 65 columns and 999 rows; **EasyPlot**, for full-page printing of charts and graphs; **EasySchedule**, sets up time and resource schedules; **EasyFinance**, helps evaluate financial opportunities; and **EasyScript**, a full-featured word processor.

In addition to these Commodore-contracted software developments, Commodore is also encouraging independent vendors to develop software for the 64. Right now over 200 software projects are already in progress, worldwide. And we might remind you here that the 64 also offers a CP/M* option that provides access to over 2000 programs in addition to those developed specifically for the 64 itself.

Some of the hottest news for the 64—and, in fact for all Commodore computers—is the huge public domain educational software package now available from Commodore dealers around the world. The package, developed by Commodore last summer in conjunction with the Ontario Department of Education and the government of Ontario, contains over 600 educational programs in business, computer science, English, Francais, history, math, science, technology and many other subjects. A complete printed catalogue, administrative programs for grading, attendance and statistical analysis, several utilities, character and sprite editor and a number of games round out the package.

The programs in this package will run on any Commodore computer, including the 64, and come on about 50 disks put together in two large volumes. For the full story on how this project came about, and Commodore's plans for continuing to develop even more educational software in the public domain, take a look at the October/November issue of *Commodore Magazine*.

And now even more seriousness for the 64—like the *Commodore 64 Programmer's Reference Guide*, which should be newly available by the time you read this. We have it on good authority that, in spite of its size (400 pages?), it is extremely friendly—in addition to being, of course, an invaluable source of information for the serious programmer. A review of the *64 PRG* appears in this December's *Commodore Magazine*. (You may suspect by now that maybe you should be reading both our publications.)

Perhaps some of you more serious programmers out there don't know about the *Commodore Software Encyclopedia*. If you've got an application-type program you think might interest somebody else or a game you'd like to market, you can get some free advertising. (Not that our magazine ad rates are high—but they're higher than free.) Just send a copy of the program to the attention of the *Commodore Software Encyclopedia*, 487 Devon Park Drive, Wayne, PA 19087. If it runs well, we'll list your product, free of charge, in the *Encyclopedia*, complete with information on how to contact you.

If you've got a powerful professional-quality product, you might also want to apply for Commodore-approved status in addition to being listed in the *Encyclopedia*. That gives you the right to use the Commodore name and logo in your advertising. If you'd like to apply for approval, send your product to the attention of our Approved Products Manager at the address above.

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*CP/M is a registered trademark of Digital Research, Inc.

HOME BABYSITTER (continued from page 61)

included to both entertain children when they're on their own and teach them some basic skills in graphic composition. By pressing various keys on the keyboard children (and adults, for that matter; this part is FUN) can manipulate a face drawn on the screen to change the eyes, nose, lips, hair, etc. They can even make it stick out its tongue. Kids can combine these feature in enough ways to make more faces than are found in the mug shots in the New York police department.

The program is very user friendly, and has a few little suprises hidden away in it. Give it to your kids and maybe you'll have time to do some adult things, like playing *Gorf*.

PROGRAM REVIEW:

VICMON

by Bruce Robinson

Commodore's VICMON is a machine language monitor cartridge that will work on any memory configuration VIC 20. It allows you to write programs in the VIC's 6502 machine language.

Machine language has two advantages over BASIC: more compact code, and faster execution (about 100 times faster for many routines). You don't need to write an entire program in machine code, you can just call a machine language subroutine from BASIC to do things that would normally take too long in BASIC.

The VICMON contains a one-line assembler. It allows you to use mnemonics to enter your program, but it does not allow labels, since it is a one-line assembler (the code is generated immediately after you enter it). And because the VICMON only uses 256 bytes of memory, it is useful even on an unexpanded VIC 20.

While it may not be a very powerful assembler, its strong suit is in debugging aids. You can set break points in RAM and ROM, and specify the number of times the program must pass through the point before halting.

There are three modes in which the VICMON can execute a program. It can run at full speed, quicktrace, or a single step mode. Single step mode allows you to plod through the program one instruction at a time. You see exactly what the machine is doing. Quicktrace will stop for break points or when you hit the 'RUN/STOP' and 'X' keys at the same time.

VICMON can move code and modify the code's absolute references. It will disassemble code, search through code for all occurrances of specified bytes, and fill in memory with a specified byte. It can display the memory in hexadecimal or ASCII format, and you can save or load a machine language program.

While the VICMON is not a sophisticated assembler, it is an invaluable aid for machine language programmers. It is easy to use and well worth $59.95.

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NEW Vic 20™ GAMES

Direct from England, JMC is proud to announce that we have been appointed the exclusive U.S. importer for the following Vic-20 games.

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MAZE OF DEATH. For 5K Vic-20. For ages 8 and over. You have to travel across the screen thru a maze of walls blocking your path. Unseen hobgobbliens and monsters may capture you before you reach your safe haven-on the other hand you may find buried treasure to add to your fortune. Full details scroll on the screen when you start game. 7 skill levels and 10 sensitivity levels to choose from.
4002-000002 $15.98

SPLOTTER' For 5K Vic-20.
For ages 8 and over. You control a worm type animal that moves over the screen to gobble up the ugle spots--a race against time. If you bump into a wall, or turn back on yourself to quickly--you LOSE. You choose skill level from #1 (hardest) to #20 (easiest). If you really want to drive someone crazy, buy him this game!
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For ages 8 and over. You must pilot you space shuttle thru a maze of asteroids to your mothership. But if you are not careful you will awaken the Guzzler''s space bouys. You have to reach your mothership before running out of fuel. GOOD LUCK.
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Alarm Clock: Use the Computer as a REAL 24 hour alarm clock, bet you can't ignore its call when the alarm goes off!
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Ages 8 and up. An army of ants is marching its way across the land leading to your home. The land is littered with rocks which make the ants change direction often. You must shoot the ants before one gets to your door. If you shoot a rock it will divide into more rocks. If you trap all the ants, then more will come until you trap all the group, then more will come until...well you get the idea...have FUN!
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SPECIAL!!
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All run in standard 5K memory; expansion allows longer texts. Std. versions for VIC printer; RS-232 versions need 8K.

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Commodore VIC 20 Price List

THE VIC 20 SYSTEM HARDWARE AND PERIPHERALS

ORDER NUMBER	PRODUCT NAME AND DESCRIPTION	RETAIL PRICE
VIC20	**VIC 20—The Friendly Computer** Commodore's revolutionary personal computer features color, sound, graphics, programmable function keys, built-in BASIC, expandable memory, low-priced peripherals and more! Connects to any TV or monitor. Includes RF modulator, switchbox, cables and self-teaching instruction book.	$299.95
VIC1530	**Commodore Datassette** Provides handy economical storage of user-written or pre-recorded programs using ordinary audio tape cassettes. Works like standard tape recorder, includes tape counter.	75.00
VIC1540/1	**VIC 1540/1 Single Disk Drive** Fast, high capacity storage and retrieval of data on standard 5¼-inch floppy diskettes. Stores up to 170K on each diskette, with read/write compatibility with PET/CBM computer systems.	399.00
VIC1525	**VIC Graphic Printer** Economical dot matrix printer makes paper copies of BASIC programs, letters, business data and graphic displays. Connects directly to the VIC, prints all characters including letters, numbers and graphics. Prints 30 characters per second. Reliable tractor feed mechanism. Device 4/5 and test switch. Accepts sprocketed roll or sheet paper.	395.00
VIC1600	**VICMODEM (Telephone Interface)** Lets VIC owners communicate by telephone, access telecomputing and timesharing services. VICMODEM cartridge plugs into the VIC's user port, connects to any modular-jack phone handset. Includes VICTERM I terminal program on tape. (Software included)	109.95
VIC1311	**JOYSTICK** Single joystick for playing computer games, remote control computing. Connects to VIC Game Port.	8.95
VIC1312	**TWO PLAYER GAME PADDLES** Double paddle controllers for two player game action. Full rotation with "fire button." Connects to VIC Game Port.	14.95

MEMORY EXPANSION CARTRIDGES

ORDER NUMBER	PRODUCT NAME AND DESCRIPTION	RETAIL PRICE
VIC1210	**VIC 3K Memory Expander Cartridge** Plugs directly into the VIC's expansion port, expands memory to 8K RAM total.	39.95
VIC1110	**VIC 8K Memory Expander Cartridge** 8K RAM expansion cartridge plugs directly into the VIC.	59.95
VIC1111	**VIC 16K MEMORY EXPANDER CARTRIDGE** For use with VIC 20 and/or VIC1010 EXPANSION MODULE.	109.95

INTERFACE CARTRIDGES

ORDER NUMBER	PRODUCT NAME AND DESCRIPTION	RETAIL PRICE
VIC1011A	**RS232C Terminal Interface** Provides interface between the VIC 20 and RS232 telecommunications modems. Connects to the VIC's user port. (Not required for modem)	49.95

RECREATIONAL GAMES ON CARTRIDGE

VIDEO ARCADE SERIES

ORDER NUMBER	PRODUCT NAME AND DESCRIPTION	RETAIL PRICE
VIC1901	**VIC AVENGER** It's an invasion of space intruders and you're the VIC "Avenger." Space action for arcade enthusiasts.	29.95
VIC1904	**SUPERSLOT** Colorful slot machine game works just like the real thing! Great music and sound effects!	29.95
VIC1906	**VIC SUPER ALIEN** You're trapped in a maze and your only defense is the "alien buster". Can you capture the aliens before they zap you?	29.95
VIC1907	**JUPITER LANDER** Pilot your "Jupiter Lander" through the treacherous crevices of a mysterious planet. Variable rocket thrust, anti-gravity, horizontal retros.	29.95
VIC1908	**DRAW POKER** Casino-style poker recreates the real thing! Superb animation and sound effects add to the fun, mystery and luck.	29.95
VIC1909	**MIDNIGHT DRIVE/ROAD RACE** Authentic night driving simulation provides thrills, chills and . . . spills? An unusual computer challenge.	29.95
VIC1910	**RADAR RAT RACE** The magical mystical mouse maze makes for a fast-paced, challenging game of wit, strategy and reflexes. Excellent graphics.	29.95
VIC1913	**RAID ON FORT KNOX** You're scurrying through a complex of tunnels below Fort Knox. Just ahead you spot the gold . . . now grab it and try to escape before the guards find you!	29.95
VIC1919	**SARGON II CHESS** SEVEN challenging play levels. Called the "best" microcomputer chess program by experts, SARGON II makes the VIC a challenging chess opponent.	39.95
VIC1921	**SUPER SMASH** The World Championship is at stake! As a finalist do you have the cat-like reflexes to return the speeding ball and take the crown? On your toes . . . this is raquetball at its toughest!	29.95
VIC1922	**COSMIC CRUNCHER** Maneuver your "Cosmic Cruncher" through the Milky Way and "crunch" all the pulsars in the galaxy . . . eleven challenging levels of play . . . over 300 color/maze combinations. Exciting arcade action!	29.95
VIC1923	**GORF* (The smash-hit arcade game!)** Midway's incredible coin-operated game is now on cartridge for the VIC! Includes 4 completely different games, multiple levels of difficulty, some of the best cartoon graphics ever devised for video games. Invaders, gorfies, death ships, saucers, aliens . . . it's terrific!	39.95
VIC1924	**OMEGA RACE* (The smash-hit arcade game!)** The ultimate space game. One of the most popular coin-op games of the year! You've got one Omegan fighter maneuvering against droid ships, command ships, death ships, photo mines and vapor mines. Fantastic "rubber band" boundaries, multiple levels of difficulty . . . all the features that made the Bally/Midway game so successful! 1 or 2 players.	39.95
VIC1925	**MONEY WARS** Lights flash, shots ring out! Can you escape or are you trapped? Look out, someone is shooting at you from the sky . . . grab the MONEY and RUN!! Increasingly difficult levels of play . . . exciting action!!	29.95
VIC1926	**MENAGERIE** Maneuver your flea through the deadly spider swamp . . . on to the mystical wall for a brief rest . . . quickly hitch a ride on one of the travelling menagerie of animals for the final trek through the desert.	29.95
VIC1927	**COSMIC JAILBREAK** Three deadly criminals are trapped behind bars . . . can you keep them in? There's a conspiracy against you . . . you are under constant attack . . . but you must protect yourself from a cosmic jailbreak occurring. FIFTEEN levels of play, increasingly fast action.	29.95
VIC1931	**CLOWNS*** Come one, come all . . . see the amazing jumping clowns . . . direct from their show-stopping Bally/Midway arcade tour . . . A true arcade "classic"! Colorful acrobatics with high scoring skill.	29.95
VIC1932	**GARDEN WARS** Maneuver your mouse through the deadly garden . . . filled with enemies . . . caterpillars, snakes, snails and spiders. This is no "Garden of Earthly Delights" . . . squirm, dodge, and run for your life through the deadly maze-like garden . . . fast arcade action!	29.95

(Commodore List continued)

ORDER NUMBER	PRODUCT NAME AND DESCRIPTION	RETAIL PRICE
VIC1937	**SEA WOLF*** As submarine commander you are in charge of sinking and destroying all enemy ships . . . destroyers, freighters and P.T. boats . . . an explosive Bally/Midway "arcade classic". Fast action fun!!	29.95

SCOTT ADAMS ADVENTURE GAMES

ORDER NUMBER	PRODUCT NAME AND DESCRIPTION	RETAIL PRICE
VIC1914	**ADVENTURE LAND ADVENTURE** The premiere Scott Adams "Adventure" game ideal for beginning "Adventure" players. Formerly available only on larger, more expensive computers. All Adventure games are decoded to "talk" on the "TYPE N TALK" voice synthesizer (available from VOTRAX).	39.95
VIC1915	**PIRATE COVE ADVENTURE** Yo, ho, ho and a bottle of rum . . . much more in this treasure island of excitement. Decoded for TYPE N TALK™ by Scott Adams.	39.95
VIC1916	**MISSION IMPOSSIBLE ADVENTURE** Your mission is to disarm a volatile nuclear reactor. Tense, challenging fun. Decoded for TYPE N TALK™ by Scott Adams.	39.95
VIC1917	**THE COUNT ADVENTURE** You're trapped in Count Dracula's castle and you have 3 days to find and destroy the vampire. Decoded for TYPE N TALK™ by Scott Adams.	39.95
VIC1918	**VOODOO CASTLE ADVENTURE** Count Yorga has been cursed and you have to free him from the curse. Voodoo statues, crystal balls and magic rings. TYPE N TALK™ by Scott Adams.	39.95

CHILDREN'S SERIES

ORDER NUMBER	PRODUCT NAME AND DESCRIPTION	RETAIL PRICE
VIC1911	**THE SKY IS FALLING** Help Chicken Little by catching pieces of the sky as they fall! A great "first game" to teach motor skills . . . fun and challenging.	29.95
VIC1912	**MOLE ATTACK** A colorful "cartoon action" game. You're trying to keep those nasty moles underground where they belong but they keep popping up! How many can you clunk before time runs out? Fast, fun, frantic!	29.95
VIC1933	**BINGO SPEED MATH** Two learning games in one. Learn to add, subtract, multiply and divide . . . while having fun. Teach your child to think and respond quickly while having fun. Math is made simple and fun with BINGO/SPEED math.	29.95
VIC1928	**HOME BABYSITTER** Three preschool game programs help teach your preschool children counting, the alphabet and relationship skills. Keep your children occupied for hours while giving him or her a headstart in school. The parent's manual helps your child get the most out of this excellent development aid.	29.95
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ORDER NUMBER	PRODUCT NAME AND DESCRIPTION	RETAIL PRICE
VIC1929	**PERSONAL FINANCE** Your budget, expenses and personal finances are simply computerized through this business package. Personal Finance will organize, arrange and computerize your home financial expenses.	39.95

PROGRAMMING AID CARTRIDGES

ORDER NUMBER	PRODUCT NAME AND DESCRIPTION	RETAIL PRICE
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VIC1212	**Programmers Aid Cartridge** More than 20 new BASIC commands help new and experienced programmers renumber, trace and edit BASIC programs. Trace any program line-by-line as it executes, pause to edit. Special KEY command lets programmers redefine function keys as BASIC commands, subroutines or new commands.	59.95
VIC1213	**VICMON Machine Language Monitor** Helps machine code programmers write fast, efficient 6502 assembly language programs. Includes one line assembler/disassembler.	59.95

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ORDER NUMBER	PRODUCT NAME AND DESCRIPTION	RETAIL PRICE
VL102	**Introduction to BASIC Programming—Part I** A gentle but thorough introduction to BASIC programming. Excellent first book for any new computerist. Tutorial lesson tapes included.	24.95
VL103	**BASIC Programming—Part II** A continuation of the excellent BASIC programming series with more programs, lessons, and instructional aids.	24.95

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ORDER NUMBER	PRODUCT NAME AND DESCRIPTION	RETAIL PRICE
VT106A	**Recreation Program Pack*** Car Chase—Fast-paced road action VIC 21—Casino-style blackjack Blue Meanies From Outer Space—Space game Biorhythm Compatibility—Compare biorhythms Spacemath—Math improvement grades 1-6 Slither/Super Slither—dexterity game	59.95
VT107A	**Home Calculation Program Pack*** Personal Finance I—Home budget Personal Finance II—Home budget VIC Typewriter—Word processor for home use Expense Calendar—Income, expenses, appointments Loan & Mortgage Calculator—Decision-making aid Home Inventory—Home belongings list	59.95
VT164	**Programmable Character Set/Gamegraphics Editor** Lets the VIC user create up to 64 programmable characters and use them in BASIC programs. The Editor takes only one-half kilobyte of program space, works with tape, disk and printer.	14.95
VT232	**VICTerm I—Terminal Emulator** A handy VIC terminal program on tape which converts any VIC to a terminal for use with a telephone modem. (See RS232 Interface)	9.95

VIC 20 BOOKS AND MANUALS

ORDER NUMBER	PRODUCT NAME AND DESCRIPTION	RETAIL PRICE
VM100	**PERSONAL COMPUTING ON THE VIC 20** The "friendliest" computer instruction guide available. The owner's manual comes free with every VIC 20 but is also in demand by teachers who use it in the classroom, and by "VIC families" who want more than one guide for each family member.	5.95
VM110	**VIC 20 PROGRAMMERS REFERENCE GUIDE** The master VIC 20 reference manual includes information on VIC BASIC, 6502 Machine Code Programming, Input/Output ports, VIC microprocessing chips, and tips for all levels of programmers. Indispensable.	16.95

ACCESSORIES AND REPLACEMENT PARTS

ORDER NUMBER	PRODUCT NAME AND DESCRIPTION	RETAIL PRICE
VIC1515P	**VIC GRAPHIC PRINTER PAPER** 1000 sheet pack, tractor feed, 15 lb. bond	15.00
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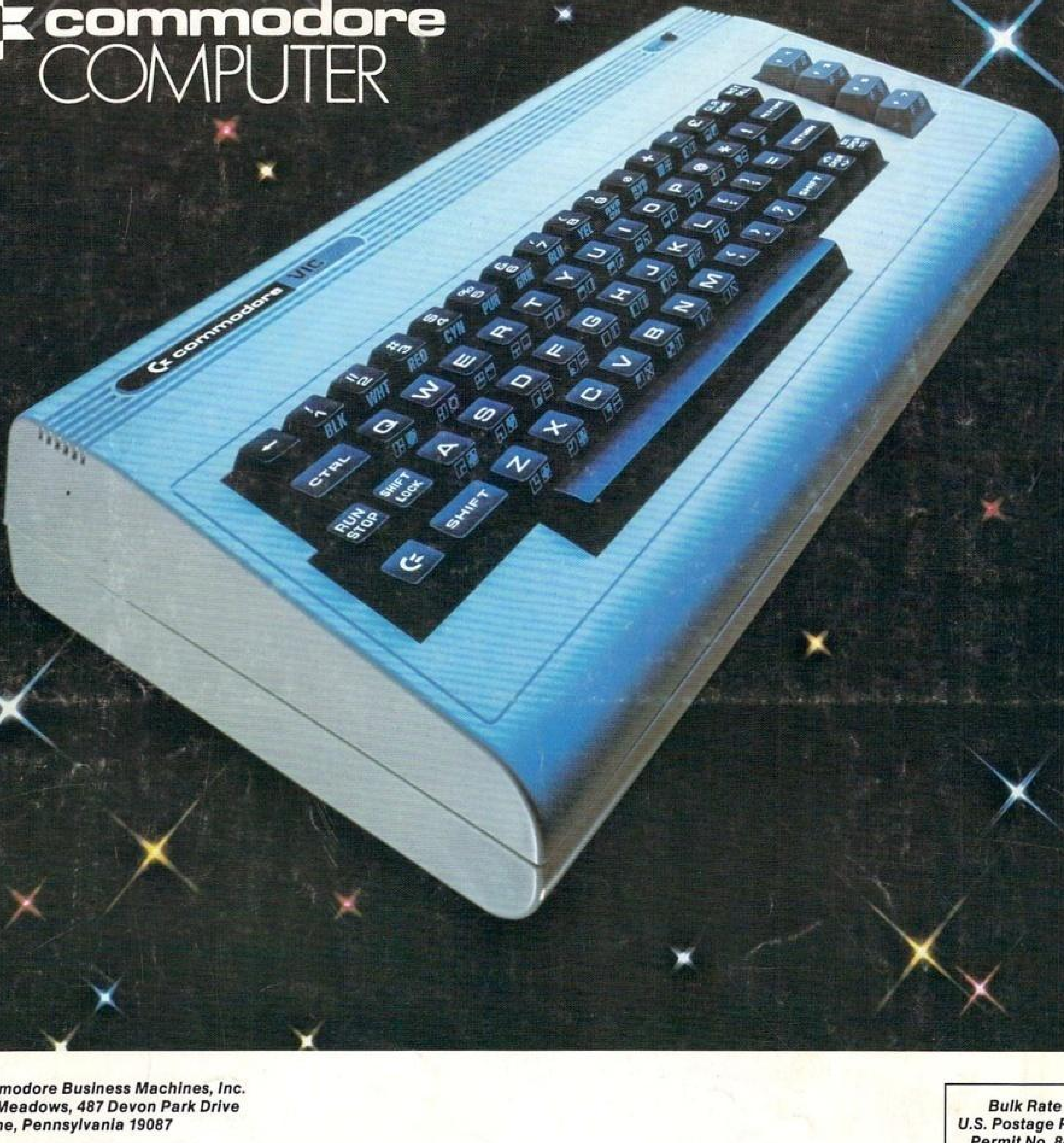

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